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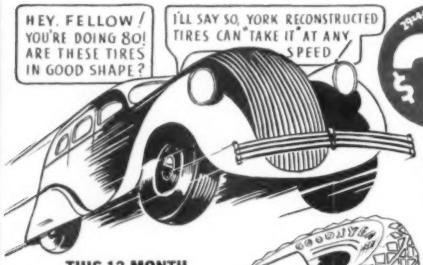

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1934

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Number 1

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William J. Kostka
Editor

A. Neely Hall
Workshop Expert

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BUILDING CRYSTAL RADIO SETS

Could you tell me where I could find plans for a crystal radio receiver that is fairly powerful, yet not expensive to build? What distance will it get? Can you use a loud speaker with a crystal set?—E. H., Oakfield, N. Y.

Receiving sets having crystal detectors have a range of only a few miles, depending on atmospheric conditions. A rather powerful set combining crystal with one tube is described on page 91 of this issue. Plans for a simple crystal set are given in the 1932 How-To-Build-It which can be obtained here for fifty cents. Both sets can be built for two or three dollars. Loud speakers can not be used with crystal sets.

A MECHANICAL EXPERIMENTER

I am interested in experimental work especially mechanical. I have some experience but have no money to go into this business. I would like to know if you could help me in any way.—E. V., Fairbury, Neb.

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MAKING ARTIFICIAL MARBLE

I would like to know how to make a cement that looks like marble for use in a shower.—M. B. B., North Bessemer, Pa.

Artificial marble can be made by mixing 100 lbs. of marble dust or levigated chalk with 20 parts of ground glass and 8 parts of fine lime and sodium silicate. The amount of coloring used will depend on the effect desired. Experiment with small amounts.

LAYING DOWN BOAT PLANS

I am having some difficulty in laying out numbers 4 and 5 frames in building Scram. Tell me how the curvature of these frames is obtained. —E. A. H., Mechanicville, N. Y.

In boat building curves are obtained by bending battens of white pine, in this case ⅜" to ½" square, until a fair curve is obtained that is pleasing to the eye. If you do not trust this method, cross hatch the architect's drawing, that is draw squares over the drawing. If the architect's scale is ¼" to the foot, you will have to enlarge the squares 48 times on the full size drawing. Then draw your line on the full size plan through squares corresponding with those on the architect's drawing. With either method curves must be faired correctly as the boat is being built.

LICENSES FOR MIDGET CARS

I would like to know if a person would have to have a driver's license to drive the midget car you ran in your September issue. Do I have to obtain license plates?—D. M., Staten Island, N. Y.

Licenses must be obtained for all motor powered vehicles. Where states require driver's license, check with the license bureau to determine if such a license is needed for midget cars. In practically all cases the license will be necessary.

ROTATING WING OF AUTOGYRO

Tell me whether the large prop on top of an autogyro airplane is driven by the wash of the front prop or is the large prop geared to the motor?—R. T., Waukegan, Ill.

The "large prop" of an autogyro is actually a rotating wing which lifts the ship. It is not geared to the motor, but is kept in motion by the air stream of the propeller and the forward motion of the ship. On the ground the wind vane is set in motion by the motor, released by a clutch as soon as the propeller's wash can keep it rotating.

ELECTRIFYING A RADIATOR

In the 1930 "How-To-Build-It" book were plans for converting an ordinary steam radiator into an electric heater. Should the radiator be filled with water after the heating coil is installed?—L. C. I., Fort William, Ont.

Much better heat radiation is obtained with the radiator filled with water, but the coil must be carefully insulated from the water and the metal frame.

"I Saved Six Orders and Made $90 in One Day . . . Thanks to This Pocket Volume!"

I'VE only been selling about a year. When I broke in, though I realized that trained salesmen are the highest paid men in the world, I expected the going to be hard at first. It was—a lot harder than I'd expected, even. At the end of six months I was commencing to get discouraged. I certainly hadn't made a flop of it—but I wasn't getting the results I should have had.

Naturally, seeing other fellows who started right with me go right ahead, I realized something was wrong. A particularly disheartening thing was the fact that at times I'd be right on the point of closing a good-sized order—and all of a sudden, it would go "flop." In fact, it kept happening all the time. I was doing something, I knew, that was killing those sales.

Finally I decided that I had to do something. I had been hearing a lot about National Salesmen's Training Association. But I'd never investigated them. Then, one day, I read one of their announcements. I was amazed to find how comprehensively they covered the training of salesmen. Furthermore, they announced that they were sending a most unusual volume, "The Key to Master Salesmanship" to ambitious men who asked for it—not only experienced salesmen, but men who had never sold, but wanted a chance in this highly paid field.

Naturally, I wrote for it—it seemed to me that here was the certain solution to the errors I had been making. Imagine my surprise—and interest—when there arrived, not only one book, but two. To this day I can't decide which of those books helped me most. The little book which I had not been expecting was just what I needed at the time. It was written for men just like me—men who had been plugging along in salesmanship—never successful, never so hopeless that they quit selling. And while "The Key to Master Salesmanship" gave me an insight into the real secrets of salesmanship, the other book, "Mistakes Commonly Made in Selling" was the one I could first get practical use from.

Right in the first few pages, I saw some examples quoted. They were things I had been doing every day. I'd never dreamed they were dangerous errors. The more I thought about them, the more clear it became, though, why I was having such difficulty with my closes. I thought to myself: "By golly, that's why Barnes decided to put off buying, this very afternoon!" I kept on thinking of men whose orders I had lost, through just that very mistake. There were six of them.

The next morning I sallied out, bright and early to see if I couldn't save those sales, using the tips given me. Before noon, I had put the practical suggestions of that little book to work—and sure enough, in every case, I made the sale which I had thought was gone glimmering. Six sales saved—at $15 commission apiece, that was $90 made, in one day, plus the advice of a little book that cost me nothing!

Of course, that set me to thinking. If that one piece of knowledge could make me $90, how much would I make out of having all the knowledge which the National Salesmen's Training Association could give me? It didn't take long to figure that one out, either! I was enrolled for the full training that same night; and the next two weeks saw my sales record soar. Not a minute of time lost—I studied just in spare hours but I learned things in those spare hours that I'd never have picked up, just by my own experience.

Today, I find amazing increase in the volume of my sales now over what they were a year ago. Then I was selling only about 40% of my quota — this month, with a quota twice as high as it used to be, I'm 50% over! And you know what quantity production means when the bonus checks roll around!

Today any man who wants to see how to end some of his biggest sales weaknesses can learn from this book some of the most frequent mistakes which spoil sales, and get practical suggestions how to end them. Not a penny of obligation—"Mistakes Commonly Made in Selling" is now FREE to any ambitious man. At the same time we will send you, also free, the new and finer edition of "The Key to Master Salesmanship," which since its publication has been read by many men who have got into the biggest pay class of salesmanship. Write for both these valuable volumes now — the coupon will bring them by return mail.

A NEW AND FINER EDITION

Thousands who read the original edition of "The Key to Master Salesmanship" are men who today are among the leaders of successful selling. Today, in addition to "Mistakes Commonly Made in Selling," we are sending "The Key to Master Salesmanship," in its new and finer edition, the product of years of salesmanship research, FREE to salesmen. Real ambition, and a desire to make the most of salesmanship, are all you need to get this volume. Simply mail the coupon and it will be sent to you, with your own copy of "Mistakes Commonly Made in Selling."

NATIONAL SALESMEN'S TRAINING ASSOCIATION

Dept. S-707, 21 W. Elm St., Chicago, Ill.

National Salesmen's Training Association,
Dept. S-707, 21 W. Elm St., Chicago, Ill.

Without obligation to me, please send me "Mistakes Commonly Made in Selling," as well as "The Key to Master Salesmanship," and full details of your various service features, including your Free Employment Service.

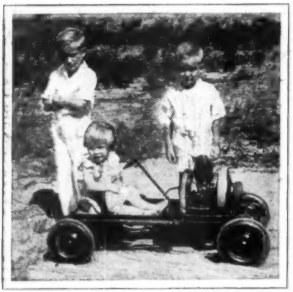
Name .....

Address .....

City ..... State.....

Age..... Occupation.....

Chips from the



This midget car has done four years' service for the children of Harold Shultz, of Angola, Indiana, who built it.

The editor gives some tips on writing for MM. Here are this month's prize winners. A call goes out for pictures of all kinds of furniture, toys and games.

EVERY month readers send letters to the editor asking if MM buys handikinks and how-to-build articles. For the benefit of those planning to ask the same question, the answer is "Yes."

We welcome kinks and how-to-builds from our readers. In many cases selling to MM helps to make the home workshop pay dividends. Preparing your copy and drawings is simple. Just describe the construction of your project in as few words as possible, being careful not to leave out any important detail.

Drawings need not be elaborate. Quite often pencil sketches will do, but they should include all necessary dimensions. Photographs make an article more valuable.

* * *

And now for the contest. First prize went to Rudolph Trimmel in far off Austria for photographs of two kyacks he built. Here is his letter:

Wien, Austria.

Dear Editor:

I have had great fun building kyacks from MM plans. They are snappy things, yet simple to build. If you don't believe we enjoy them, just look at the smile of happiness on the girl, kyacking under the starred flag of the U. S.

These two kyacks were finished a few days ago, and are said to be the first on the continent.

Rudolph Trimmel.

From the first prize money of $5.00 Trimmel elected to take copies of all editions of the How-to-Build-It book and How to Build 20 Boats. Incidentally How to Build 20 Boats contains plans for an Eskimo kyack.

* * *

A tractor job brought down second prize of $3.00 this month. It goes to Ralph P. Blanchard whose prize winning letter follows:

White Plains, N. Y.

Dear Editor:

Here is a picture of my "Bulldog Pup." The entire unit was built by myself except one welded joint.

This "Bulldog Pup" has a 54½" wheelbase, six speeds forward and two in reverse. Power plant is "Ford A" with worm drive rear end. Tires are moulded, concrete filled. The speeds run from about four miles per hour in low low to 40 m.p.h. in high high.

Ralph P. Blanchard.

A good job, isn't it? Blanchard also converted the plow from a riding plow.

This Monotype was built by Maurice Trumpour for only $60. That figure, he says, includes the "tailor-made" sail.

editor's workbench

PRIZE WINNERS At top are two kyacks built by Rudolph Trimmel, of Wien, Austria. He received first prize of $5.00. Second prize went to Ralph Blanchard, of White Plains, N. Y., for the tractor. Lieut. Stanley Stewart's Spanish ship model won third prize. The Workbench awards three prizes each month.

Lieut. Stanley Stewart sent us a fine photo of a Spanish model ship and a letter describing the difficulties he had to overcome to build it. He won third prize of $2.00.

Brooks Field, Texas

Dear Editor:

Here is a photo of a Spanish ship model which was built under unusual conditions. It was begun while I was a cadet at West Point. All the materials and tools were kept hidden in a stationery box because such articles are not "regulation." All the small parts were made with what small tools I had over a period of a year and a half. The ship was assembled after I was graduated.

Lieut. Stanley R. Stewart.

* * *

The Workbench is conducting a contest every month. If you want to win a prize send in a photo and an interesting letter. So far boats and midget cars have been "bringing home the bacon." Let's see some photos of furniture, toys, games, or models you have built.

That fine Monotype shown in the photo was built by Maurice Trumpour who says:

Vancouver, B. C.

Dear Editor:

Just a line to express my delight in my Olympic Monotye which I built last spring and sailed all summer. She's a great sailor and it has made me more boat-minded than ever.

Except for the back deck and two extra stays she is exactly to the inch as the plans called for. Every foot of her 12 feet makes a real good boat for only $60 which includes a "tailor-made" sail.

Maurice Trumpour.

Plans for the Monotype, a 12-foot boat, appear in How to Build 20 Boats, which can be obtained from MM for 50 cents.

* * *

Victor Fick has the honor of being the first MM reader to build the six tube auto radio set that appeared in the September issue. He tells us this about it:

Buffalo, N. Y.

Dear Editor:

This is just to let you know that I have completed the automobile radio set described in your September issue.

The set works very good. I wish to praise you very highly for your radio pages. There sure is a variety of very helpful hints along with good, clear, concise radio diagrams.

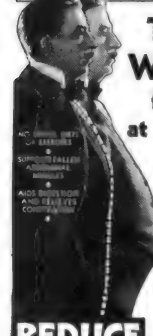
Victor Fick.

* * *

The Tygart Mechanics Club of Elkwater, W. Va., has been granted charter No. 22 in the International Society of Modern Mechanix and Inventors. Woodrow See is president; Ralph Shaffer, secretary; and John Marple, treasurer.

"I REDUCED MY WAIST EIGHT INCHES"

WRITES GEORGE BAILEY



TEST the WEIL BELT for 10 days at our expense!

"LOST 50 pounds," says L. W. T. Anderson . . . "My waist is 8 inches smaller," writes W. L. McGinnis . . . "Felt like a new man" claims Fred Wolf . . . "Wouldn't sell my belt for $100," writes C. W. Higbee. So many wearers are delighted with the results obtained with the Weil Belt that we want you to test it for ten days at our expense!

Greatly Improves Your Appearance!

● The Weil Reducing Belt will make you appear many inches slimmer at once, and in 10 short days your waistline will actually be 3 inches smaller—3 inches of fat gone—or it won't cost you one cent! ● It supports the sagging muscles of the abdomen and quickly gives an erect, athletic carriage.

REDUCE Your Waist 3 INCHES IN 10 DAYS OR money refunded

● Don't be embarrassed any longer with that "corpulency" for in a short time, only the admiring comments of your friends will remind you that you once had a bulging waistline.

The Massage-Like Action Does It!

● You will be completely comfortable and entirely unaware that its gentle pressure is working constantly while you walk, work or sit . . . its massage-like action gently but persistently eliminating fat with every move you make!

● Many enthusiastic wearers write that the Weil Belt not only reduces fat but it also supports the abdominal walls and keeps the digestive organs in place—that they are no longer fatigued—and that it greatly increases their endurance and vigor!

Don't Wait—Fat Is Dangerous!

● Fat is not only unbecoming, but it also endangers your health. Insurance companies know the danger of fat accumulations. The best medical authorities warn against obesity, so don't wait any longer. ● We repeat—unless you take off 3 inches of fat in ten days, or it won't cost you one penny.

SEND FOR FREE 10 DAY TRIAL OFFER

THE WEIL COMPANY, INC.
3911 Hill St., New Haven, Conn.

Gentlemen: Send me FREE, your illustrated folder describing The Weil Belt and full details of your 10 DAY FREE TRIAL OFFER.

Name _____

Address _____

City _____ State _____

Use Coupon or Send Name and Address on penny postcard.

GET THRILLING POLICE CALLS

ON YOUR PRESENT RADIO

$1.00 Postpaid — Get One Today

New Marvel Police Adapter brings them in clearly on your old set. Simple attachment provides reception you have never had before. Quickly attached to any set. Full directions inclosed. Takes less than 5 minutes to connect. No tools! No drilling! No soldering!

POLICE—AMATEUR SHORT WAVE CALLS

Delight your friends with a new type of entertainment! There's lots on the air that is exciting. You can get it—with the Marvel! Dealers and Jobbers write quick. Sample mailed anywhere, postage prepaid, for only $1.00

JOBBERS — DEALERS

Get surprises on radio leading and aerial wire; ground clamps; window leads; Vernier dials; radio knobs; auto antennae; push-back wire and shielded wire.

SPECIALTIES MANUFACTURING CO.

3836 Grand River Ave. — Detroit, Mich.

Chucks for Small Lathes

Lowest Prices Ever Offered

A quality tool, accurately made. Send draft or money order. If not entirely satisfied, return chuck in 5 days and we will refund your money. Postpaid

1 inch Chuck $3.87 — 1 inch Chuck $3.87

JOHN L. ALEXANDER — 434 E. Superior Street — Detroit, Mich.

CASH INCOME DAILY

Resilvering Mirrors At Home.
Replating Autoparts, Tableware, Etc. Outfit Furnished. Write—

SPRINKLE, Plater, 855, Marion, Ind.

GET YOUR 1934 COPY NOW!

HOW-TO-BUILD-IT

Written by experts for

AMATEUR SHOP FANS

and

PROFESSIONAL MECHANICS

Crammed with simple, comprehensive plans telling you how to build midget cars, telescopes, radios, canoes, furniture, diving helmets, engines, iceboats, cameras, camping trailers, boats and a host of other fascinating projects.

NOW on SALE EVERYWHERE Get It Today **50c**

If your dealer cannot supply you, write to

MODERN MECHANIX PUBLISHING COMPANY
529 S. 7th St., Minneapolis, Minn.

Train for TELEVISION«

Golden Opportunities Await Television-Trained Radio Men

6 Months Genuine Training at my government licensed television broadcasting station W9XAL — 500 watts.

S. Q. Noel, Pres.

Studio scene W9XAL during broadcast of famous movie stars.

Student engineers qualifying for federal radio operator's licenses.

"Take it away." Student engineers flash actual broadcast on air.

Buddy Rogers — another famous star — broadcasts over W9XAL.

$50 ENROLLS YOU

A year to pay balance if desired. Many of my graduates pay for their training after they are through and "on the job" working in excellent positions at famous broadcasting stations.

No Previous Experience Needed

My master course starts you from the first and takes you, step by step, from elementary electricity and radio up to and through the advanced television training. You need no previous radio experience—I will give it to you here in my marvelously equipped laboratories. If you have had radio experience, I will allow you tuition credit for it.

Thorough Radio Training Included

in my master course. Television is an advanced radio science and naturally preliminary course in radio must be of the finest. An average of 87% of my graduates pass their federal exam and receive a radiotelephone operator license (1st class) —the highest broadcast license issued by the government. Sound engineering and aircraft radio also included.

Get Your License and Service Record While Here

My students qualify for their licenses then serve as operators and control room men while television pictures are being broadcast. Your service record will be certified on the back of your license and you go out an experienced man.

Licensed Men Given Preference

these days because the industry wants thoroughly trained men more than ever — and television trained men are being selected for the good jobs. There are no jobs for the half-trained novice. A gov't. license is a passport to a real job with a future.

Free Employment Service

while attending school and after graduation. I will assist you to find part time work to help defray living expense while in school. I will also give you free employment service for life on graduation.

MY GRADS SAY—

Television Expert

★ I am in complete charge of television here and have designed and supervised construction of all television apparatus. M. E. EISENBERG, in charge of Television Development at WDGY (also television station W9XAT), Minneapolis, Minn.

Aircraft Radio

★ This is radio headquarters for TWA and my department does all the service work for the entire Air Transport line. I got the job because I was a trained man — a licensed operator. JACK MURRAY, Transcontinental and Western Air, Inc., Municipal Airport, Kansas City, Mo.

Broadcast Station Operator

★ Many thanks for securing this job for me. Your laboratory work is very practical . . . a very helpful part of the course is the actual experience at W9XAL . . . and "riding gain" on sound programs. CLARK B. SMITH, Radiotelephone operator (1st class), license number 17-503. Radio Station WLBF.

OTHER JOBS FOR FIRST NATIONAL GRADS

Other jobs leading to $50 a week and up: Television Research Technician; Television Installation Engineer; Television Consulting Engineer; Radio Engineer; Operator Broadcast Station; Aircraft Radio Engineer; Service man on sound picture equipment; Service man on Public Address systems; Radio set service man; Sales Engineer; Maintenance Engineer; and many others.

HOME OF W9XAL First National Television, Inc., occupies the four top floors of this beautiful new building. Here are my fine, fully equipped laboratories and modern television studios, with the very latest modern television broadcasting equipment. W9XAL is licensed to broadcast pictures by authority of the Federal Radio Commission (not an amateur station).

MAIL COUPON FOR FREE BOOK ABOUT TELEVISION

S. Q. Noel, President Training Division
FIRST NATIONAL TELEVISION INC., Dept. G-11
Power & Light Bldg., Kansas City, Mo.

Dear Mr. Noel:
Send me your free book about television without further obligation to me.

Name .....

Address .....

PERFECTED TELEVISION

by **DEAN S. JENNINGS**

Philo Farnsworth (above), young San Francisco inventor, asserted in 1926 that mechanical scanning discs were far too slow for television — today he offers to the public perfected television, with electric scanning coils.

Farnsworth's amazing cold cathode tube, shown at left, is combined detector, amplifier, rectifier, and television tube. Hollow ring anode is mounted between two caesium cathode discs.

MOVIES, plucked from the air . . . Football games, seen from a fireside chair . . .

Distant places, noted stars of the stage, industry at work, drama, thrills, all living on a screen in your radio set!

No dream this—for television is now perfected and ready for a hungry market, ready for your home! And before many months pass its wonders will be commonplace, its intricacies clear to every radio set owner.

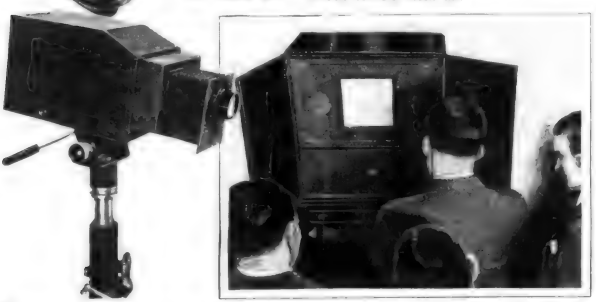
In a San Francisco laboratory operated by Television, Inc., a combination radio-television receiver is functioning at this writing, a compact set in a beautiful cabinet which, when marketed, will probably sell for $250 or less. In another department of the same laboratories stands a television transmitter, equally efficient, an assembly that can easily be installed in any radio broadcasting station.

What happened to all those television "bugaboos?"

They were eliminated, conquered after long years of work by Philo Farnsworth, young San Francisco inventor who has a stranglehold on television patents.

When television research was begun, the problems facing science were:

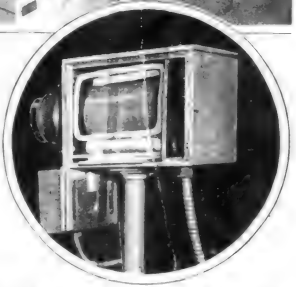
To develop an efficient transmitter and receiver; to find sponsors for television programs; to make a set within cost reach of everyone; to make that set compact. Farnsworth solved them all.



First commercial model of perfected television transmitter, shown at left, can be trained on outdoor action scenes in same manner as newsreel camera. Amazed at perfection of televised image, audience at right views demonstration of cabinet model radio-television receiver. A prominent radio manufacturer soon will market television equipment.

NOW READY *for the* PUBLIC

Practical television is here! Philo Farnsworth's compact electron camera transmitter and cathode ray receiver will bring movies, radio studio, and even outdoor scenes to every home with magical, photographic clearness.



Above is Farnsworth's present television laboratory. Inset shows scanning and focusing coils on laboratory transmitter.

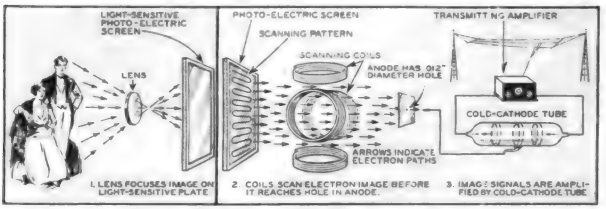
I have just finished an inspection trip of Television Laboratories in San Francisco.

There, from a chrysalis of wires, transformers and tubes has emerged the finished television set. It is a set soon to be turned out by one of the nation's foremost radio manufacturers. We sat in a darkened room, watching the polished walnut cabinet with its glass "screen," chatting with Chief Engineer A. H. Brolly.

"I'll be back in just a second," he said, leaving the room. And he was—on the screen! We saw him sitting in a chair in another part of the building, we heard him talking, clearly, crisply.

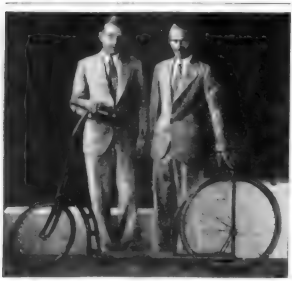
The image was sharply defined, a shimmering green vision twelve by fifteen inches in size. This was perfected television, using the type of set you will have in your home. The image was broadcast from a transmitter available now to radio broadcasters. By the time the receiver is marketed, it can be used in a room in which there is even greater illumination than ordinary daylight.

(Continued on page 129)



Pictorial diagram shows in general manner how new televising system operates. Transmitting camera, 14 in. long, creates electrical instead of optical images for scanning. Cathode tube multiplies electrons six times each hundred-millionth second.

Body Sway Drives Eccentric Bicycle 15 Miles Per Hour



By rocking back and forth in rhythm with up and down movements produced by eccentric rear wheel of new bicycle, inventors assert speeds as high as 15 m.p.h. can be maintained over long distances. The footboard is resilient.

CALLED the simplest self-propelled vehicle in the world, a radically new type of bicycle, entirely without pedals, is driven by body motion alone.

The rear wheel of this "x-ercycle," as it is called, is eccentric; the rider stands on a springy footboard and swings his body in rhythm with the up and down movement of the frame to produce forward motion.

After acquiring the correct rhythm of movement a rider can travel long distances comfortably at speeds as high as 15 miles an hour, according to the two Chicago brothers who are its designers.

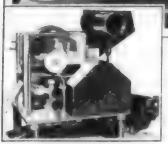
The axle of the rear wheel is mounted some distance from the true center by using wire spokes of different lengths.

Electric Eye Clocks Race Horses

WITH the announcement of a new invention designed to make the timing of horse races entirely automatic, electricity has even invaded the field of sports.

The "electric eye" principle is used. Beams of light focused across the track at the quarter, half, and at the wire record on a ticket the time of the leading horse for each part of the race.

The two San Francisco inventors who have thus eliminated need for the hand-operated stop watch are P. A. Cutter and E. A. Fitzgerald. They have demonstrated their invention to prominent sportsmen.



Above: P. A. Cutter, left, one of inventors of electric horse race timing device, demonstrates before San Francisco sportsmen. At left is closeup of "electric eye" timer, which prints on ticket time of leading horse for race.

Angler Gets Record 956-lb. Tuna

Thomas Howell, Chicago financier, poses with 792-lb. tuna caught few days before he landed record 956 pounder near Liverpool, Nova Scotia. Fish was landed after 62-hr. battle.

TIPPING the scales at 956 pounds, the biggest tuna ever caught with rod and reel was pulled out of Liverpool bay, Nova Scotia, recently by Thomas Howell, Chicago financier.

More than 200 pounds heavier than Zane Grey's record catch of a few years ago, the giant fish was landed after only a 3½ hour battle. The strain of the line, holding the mouth of the fish open, actually drowned it.

WIND TUNNEL *Tests Skyscraper Sway*

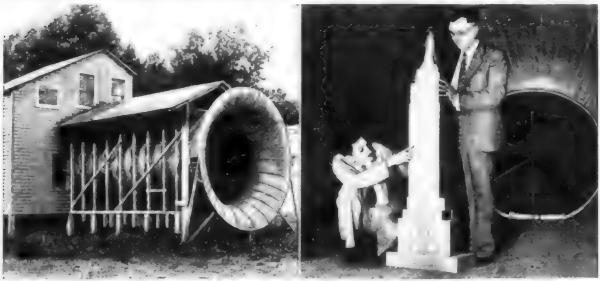


Photo left shows exterior of wind tunnel constructed by Bureau of Standards, Washington, D. C., to test resistance of skyscrapers in high winds. Right—A model of the Empire State building is placed in the tunnel for observation.

UNDER the direction of scientists attached to the Bureau of Standards, Washington, D. C., a specially constructed wind tunnel has been built to test the resistance of projected skyscrapers to the gales of the upper air.

An accurate scale model of the building to be erected is placed in the tunnel and subjected to various tests by trained observers, who then make suggestions for necessary changes.

The problem of wind resistance is an important factor in skyscraper construction. The world's tallest building, the Empire State, rocks a full 15 centimeters—about six inches—at its highest point.

Feathered Hitch Hiker Gets Ride

A friendly greyhound solves transportation problem for feathered New Jersey hitch hiker.

THANKS to a dog's co-operation, the problem of effortless transportation has been solved in novel manner by a feathered hitch hiker.

Enlisting the aid of a friendly greyhound at the Long Branch, N. J., Kennel Club, a dauntless sparrow rides hither and yon, perched in comfort on a miniature trapeze suspended from the dog's mouth.

Cabinet Stores Food Appliances

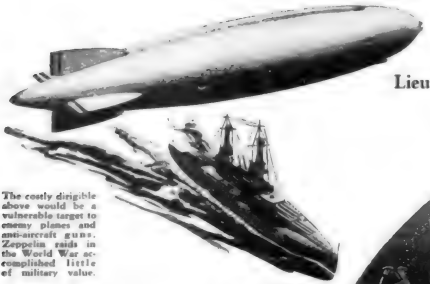
ONE of the latest conveniences for housewives is a wheeled cabinet designed for the use and storing of electrical appliances employed in kitchen or dining room. The cabinet has a heat-resisting top and triple-plug receptacle which permits hooking up of appliances to regular house circuit.

Rubber casters permit moving the cabinet alongside of the table; and three wide doors give ready access to storage shelves.

Ample storage space for electrical food appliances is provided in this cabinet. Top is heat-resisting to permit use of appliances such as waffle iron, grill, toaster or percolator.

IS AERIAL

by
Lieut. John Edwin Hogg
U. S. N. R.



The costly dirigible above would be a vulnerable target to enemy planes and anti-aircraft guns. Zeppelin raids in the World War accomplished little of military value.

Editor's Note—Statements by aviation enthusiasts that airplanes will wipe out cities, destroy fleets and armies, and win the next war prompted this article by Lieut. Hogg, noted writer on military topics. In it he makes startling revelations about the effectiveness of the airplane as a military weapon. The observations and opinions expressed in this article are those of the author and should not be construed as reflecting the official views or opinions of the United States Navy Department.

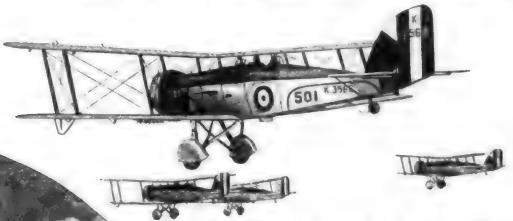
DIRE predictions of the terrible destruction and wholesale slaughter by airplanes in the next war are popular subjects for writers of leading magazines and newspapers. Alleged experts with little regard for facts have told us that the airplane is invincible and invulnerable and has doomed to the scrap heap practically every other weapon of war.

Battleships are to be bombed off the seas. Cities and enemy military positions are to be demolished with bombs and poison gas hurled from the sky, with the odds for victory 100 per cent in favor of the aerial attacking forces.

During the World War airplanes sank no battleships, destroyed no city, and failed in every attempt to bomb or gas an enemy out of a military position. The airplane of today is somewhat improved. It can fly faster and farther. It can go higher and carry slightly heavier loads. Essentially, however, it is still the same old airplane of the World War period. It cannot operate in all weather. It cannot rise vertically. It cannot stand still in the air. Its cruising radius and carrying capacity is still very

Top photo shows two 1100-lb. bombs on plane's wing. The ship's effectiveness is over after dropping four such bombs. Lower photo shows aerial bombing of Pee-Dee river bridge. Although unhampered by anti-aircraft batteries, the bombers dropped several 600-lb. bombs and finally resorted to 1100-lb. bombs to break this single span.

WARFARE DOOMED?



English bombers are shown above flying in attack formation. It would cost $714,000,000 a day to finance an aerial fleet to effectively attack a city the size of New York.

The antiquated ship in the above photos was merely a floating target unprotected even by its own guns. Yet airplanes dropped many bombs before scoring the direct hit in the top photo. After the attack, the battleship (shown in the lower photo) was still afloat, its guns undamaged. Anti-aircraft guns and pursuit planes on modern battleships undoubtedly would have broken up the bomb attack.

limited. It is highly vulnerable and cannot be adequately armored. In short, it retains all its inherent limitations. In a military sense it offers at best only a hit and run method of fighting. It can take nothing. It can hold nothing. It cannot stay and fight!

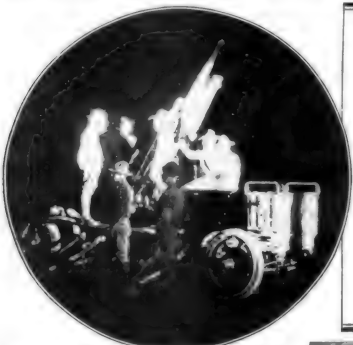
The natural hazards of military aviation even in times of peace are recognized by every government in the form of increased pay to the men who choose aerial duty. The mortality of peacetime naval aviation averages 100 per cent every five years.

Anti-aircraft Guns Stopped Raids

The hazards of military aviation in time of war will be infinitely greater. Indeed, it is not difficult to find many intelligent flying officers in both the United States Army and Navy who predict that the first 30 days of any major war will see the complete elimination of the air forces of belligerent powers. This estimate, of course, may be too high. Nevertheless, our own War Department conservatively estimates that 25 per cent of our air service personnel and equipment will go out of action during every 90 days of actual war conditions.

There was no such thing as an effective anti-aircraft gun during the early stages of the World War, but no sooner were major aerial bombing raids attempted before anti-aircraft guns made their appearance. The first such guns were crude and ineffective. Their improvement, however, was very rapid, and they, more than fighting airplanes, put an end to the major German air raids over London and Paris. Toward the end of the war it was almost certain death for any aviator attempting to fly over an enemy anti-aircraft battery.

Improvements in anti-aircraft guns and gunnery have advanced in recent years beyond any improvements in aircraft.



Since air attacks usually come at night, the anti-aircraft battery above trains in darkness to bring down enemy ships.

STARTLING STATEMENTS

"During the World War airplanes sank no battleships, destroyed no city, and failed in every attempt to bomb or gas an enemy out of a military position."

"The first 30 days of any major war will see the complete elimination of air forces of belligerent powers."

"No aviator entertains the thought that he is going to fly over an enemy anti-aircraft battery in time of war—and live to tell the tale."

"Air raids over London and Paris during the four years of the World War destroyed less than $5,000,000 worth of property and killed fewer than 700 enemy civilians."

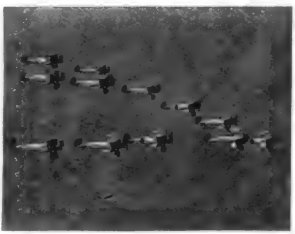
"It would take 75,000 bombers to carry the load of bombs equivalent to the weight of shells carried by the 15 bat-

Rangefinders and fire directors have been developed to perform feats of apparent magic instantly and accurately beyond the average human imagination. Among scores of both army and navy aviators, I have yet to meet even one who entertains the thought that he is ever going to fly over an enemy anti-aircraft battery in time of war—and live to tell the tale.

German Raids Cost Millions

The German Zeppelins of the World War period carried about ten times the load of bombs that any airplane can lift today. The Gotha bombing planes carried two tons, which is about the same load that a good bomber can get off the ground nowadays. Unopposed as these raids were except by airplanes and crude anti-aircraft guns, the whole series of air raids over London and Paris during the entire four years of the war destroyed less than $5,000,000 worth of property. They killed fewer than 700 enemy civilians, which is about the number killed in London traffic accidents every year.

London and Paris were far from "blown off the map" when the war ended and Germany had paid dearly for a series of aerial offensives of very questionable value. She lost 486 trained air men in the Zeppelins and airplanes that were brought down by the enemy. The air raids had cost her tens of millions of dollars; all for the privilege of killing some 700 non-combatant civilians, and smashing up $5,000,000 worth of enemy property. From a military viewpoint these air raids accomplished less than nothing.



Twelve naval planes from the U. S. S. Lexington are shown in perfect formation. As an adjunct to a naval or land force, airplanes are important in military maneuvers.

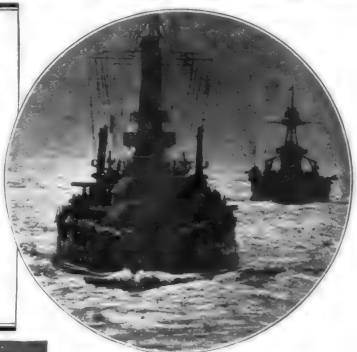
Editorial champions of aerial military supremacy are forever writing about the terrors of bomb-dropping from altitudes above the range of modern anti-aircraft guns. They close their eyes to the fact that no aerial bombing can be effective unless the aviators can clearly see the target they are trying to hit. It is a well-established fact that any bomb-dropping from an altitude of more than about 4000 feet is notoriously inaccurate. The lower a bomber can fly the greater becomes its bombing accuracy, but there will be no low-altitude bomb-dropping in any future war. The modern anti-aircraft machine gun discourages that. These guns, throwing a veritable hailstorm of 50-caliber bullets, are effective up to 7,500 feet, and will pierce a quarter

ABOUT AERIAL WARFARE

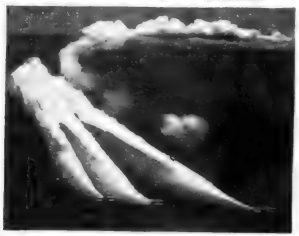
tleships of the U. S. Navy. The cruising radius of those bombers would be only 500 miles. A battleship can travel 15,000 miles regardless of weather."

"A shell will drill through heavy armor plate or through concrete walls. It explodes inside to produce a shattering internal explosion. An aerial bomb, having no such power of penetration, pops off like a paper firecracker against whatever it hits."

"It would take 28,000,000 pounds of phosgene gas to 'wipe out' an area the size of New York City. To accomplish this the enemy would have to have 14,000 bombing planes and 280 naval airplane carriers to bring the planes within striking distance of New York."



The battleship will continue to be one of the most important military machines of any nation in the next war.



The smoke screen being laid by these naval planes hides the fleet and makes attacking bombing planes useless. Such a smoke screen can be laid down in a few minutes.

of an inch of boiler plate at that height.

A large bombing plane may carry two tons of bombs. It would take about 5000 of the largest modern bombing planes to carry the potential load of destruction represented by the shells in the magazines of a battleship, and the battleship has a cruising radius of 15,000 miles anywhere on the seas compared with the bomber's 2-ton load and 500-mile cruising radius. Moreover, a battle fleet or a battery of field artillery can STAY AND FIGHT as long as it remains afloat or as long as transportation lines can be kept open. The bombing plane must quit as soon as its two ton load of bombs is dropped.

All the military bombing planes in the world today would have to wait for favorable weather, and would then be capable of only a comparatively short overseas flight with half the load of shells a battleship can carry 15,000 miles regardless of weather. It would take roughly 75,000 bombers to carry a load of bombs equivalent to the weight of shells in the magazines of the 15 battleships of the U. S. Navy, and the cruising radius of those bombers would be only about 500 miles away from a base of operations.

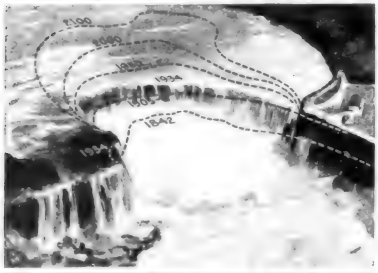
Gas Terrors Are Myths

Gas distributed over vast areas by airplanes is another horror-myth overworked in defiance of the laws of physics by aviation enthusiasts. There are gas masks that are effective against all gases. It takes unbelievable quantities of gas to build up an effective concentration over even a limited area. It takes, for instance, 300 pounds of phosgene to gas an area of 100 square yards effectively. This means that it would take 28,000,000 pounds of phosgene, very evenly distributed, to "wipe out" an area the size of New York City, if there were no gas masks. To accomplish this an enemy would have to have 14,000 large bombing planes and 280 naval airplane carriers to bring these planes within striking range of New York. Does anyone think for a moment that Uncle Sam would be whittling a stick while any other nation is building 14,000 bombers and 280 airplane carriers?

Some editorial writers claim that an air fleet that could destroy every important

(Continued on page 124)

Scientists Predict Crumbling Rock Will Destroy Niagara



Dotted lines in above sketch indicate how crest of Horseshoe Falls at Niagara have been moving back at the rate of 3.7 feet per year. How Falls will appear in year 2100 is shown above. 1934 rock fall of 30,000 tons is indicated at left tip of horseshoe, with debris showing just below.

WITH the crest of Niagara Falls receding at the rate of 3.7 feet a year since 1842, scientists have calculated that by the year 23053 the sixteen miles of rock between the Falls and Lake Erie will have broken down entirely, leaving only a series of cascades and rapids.

Before the startled eyes of Patrolman Horatio Collins 30,000 tons of rock toppled from the crest of Horseshoe Falls this summer, removing a slice of rock 200 feet long and 30 feet wide. So mighty was the splash that water shot up 200 feet, far above the crest of the falls itself.

There is a simple explanation for this sudden tumbling of rock, and for the constant erosion too. Water flows over a hard top layer of dolomite, but eats away the soft rock underneath which is exposed at the falls. Left without support, the crest rock breaks down by its own weight in successive crumblings. The breaks, however, always leave vertical walls which have not seriously impaired the beauty of the Falls.

Largest Wood Prop Is 16′ in Diam.

THIRTEEN laminations of white birch plywood, held together by five gallons of glue, make up what is now the world's largest wood propeller, recently shipped to Langley Field, Va., for a gigantic Free Spinning Wind Tunnel.

As a rough block before carving the propeller weighed 475 pounds; when finished it was brought down to 194 pounds. It is 18 inches wide at the hub, 17 inches wide at the center of the blade.

How world's largest all-wood prop., 16 ft. in diam., appears alongside standard-size units. Four-bladed propeller shown is smallest used for wind tunnels.

The tips of the blade have been sawed off square, to increase efficiency for wind tunnel use and deliver a smoother air blast. In any wind tunnel the flow of air as delivered by the motor-driven propeller to the model testing chamber should be of uniform velocity as far as possible. This condition is achieved by careful design of the pitch and contour of the blade, and by tests with smaller propellers.

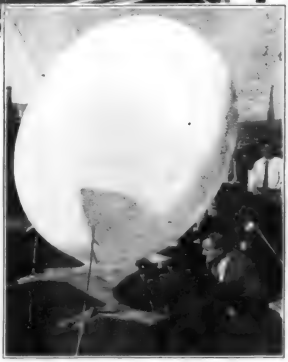
Army Gets Smokeless Field Kitchen

Portable army kitchen shown here boils, fries, and bakes; it can prepare enough food at one time for 240 men. Hot meals can now be cooked on march or transport movements.

FURNISHING hot food to troops in the field has long been a troublesome army problem. If the kitchens were brought up close, smoke would reveal their location and draw gunfire. Farther back, food would be cold by the time it could be brought up to front-line troops.

A new portable kitchen recently tested by the Infantry Board at Fort Benning, Ga., burns gasoline and is smokeless. It is portable, being easily lifted into a truck by four men.

Robot Balloon Seeks Cosmic Ray Secrets



Photos made exclusively for Modern Mechanix and Inventions. **Photo above shows operator with cosmic ray meter which will be used to measure intensity of rays in forthcoming flight. Right above—A Chicago scientist at the receiving set of the robot balloon's stratosphere radio hookup.**

Dr. Arthur H. Compton, cosmic ray research pioneer, is shown preparing to release the small robot balloon on its recent successful test flight into the stratosphere.

LIVES have been lost and millions of dollars spent in stratosphere flights seeking to solve the mystery of the cosmic ray. Now a radio transmitter, attached to a small balloon, promises to remove both human and financial risk and open new fields in stratosphere exploration.

The initial experiment was recently conducted by Dr. Arthur H. Compton of the University of Chicago, one of the world's pioneers in cosmic ray research. At his signal a fifteen-foot balloon, inflated with hydrogen, was released from the roof of Ryerson laboratory, in Chicago. Dangling beneath the balloon was a radio antenna and a tiny gondola which held a midget radio transmitter.

As the balloon soared upward, Dr. Compton and his assistants dashed for a sheltered corner where a radio receiver was busily recording, in a series of dashes on paper tape, the story of the rising balloon.

The message was tremendously important. It revealed not only the balloon's height but also established the success of radio as a reliable reporter which might be sent, at small expense and without risk of life, far into the stratosphere to "talk back" to earth.

At an estimated height of more than 17 miles, higher than man's flights into the stratosphere, the balloon burst under pressure and its precious freight fell into a field about 40 miles from Chicago.

As the balloon was released, part of the radio antenna was snapped off so that the tuning of the incoming signals from the balloon-borne transmitter was changed and the range of the set was shortened. At a height of slightly more than nine miles, the incoming signals were lost; but the test, according to Dr. Compton and his associates, was "one hundred per cent successful."

In future flights the balloon will carry a radio transmitter, a thermometer, a barograph and, most important of all, a cosmic ray meter. These instruments are the result of months of patient toil and are pioneer units of their kind. Briefly, this is how they work:

(Continued on page 142)

Building Skyscrapers

by
ALFRED ALBELLI

TOILING like so many human spiders, an army of men swarmed over the gaunt framework of the Chrysler building, spinning a web of towering steel across the sky.

Perched on I-beam struts or narrow catwalks forty stories above the street, the men bent their backs to their work, oblivious to the ear-splitting din of tooting whistles, creaking winches and yammering rivet guns.

Suddenly there came a series of jangled explosions which tore the heavens open. Cold terror clutched the hearts of the erection gang. A load of steel large enough to wipe out the greater part of New York, if converted into ammunition, had snapped a hoist cable and was plunging down through the network of beams.

Photo at left shows a gang of bolters and setters at work. These men swing the girders into place and fasten them temporarily. The bolter's work is one of the most hazardous of all steel jobs and calls for shock-proof nerves.

WITH THE *Steel Birds*

Above and left—Welders at work, perched precariously on a narrow I-beam strut. Right—A gunner smashes a red hot rivet home, fastening the girder securely in place. Note his unconcern, with possible disaster yawning at his feet.

Frenzied screams, bells and other warning signals were drowned out by the terrific clangor as the huge beams hurtled downward. The steel birds cowered on their narrow perches in an agony of suspense. For a few harrowing seconds the specter of a horrible death hung over the steel skeleton. Then it was over, as the murderous beams struck with a resounding crash that shook the earth.

Steel Birds Cheat Death

Miraculously enough, there were no casualties, a fact which may be attributed not to luck but to the improved system of architecture and construction in skyscraper building. Shortly afterwards, work was resumed and 36 additional stories were reared without a single serious mishap.

Despite all protective devices, however, the steel bird's job is an inherently dangerous one. No amount of caution can prevent from 20 to 30 minor accidents in the average day. Yet the steel worker does not brood on the perils of his trade.

Timothy McIntyre, steel bird foreman and one of the most colorful veterans in the business after twenty-odd years as a steel worker, sums up the philosophy of the steel gangs: "Like every other job with the life-risk in it, it's a matter of keeping on the alert and keeping your mind on your work. The steel bird must be totally unconscious of the risks he takes every minute of his working day. If he were conscious of a mental hazard he would be licked and useless.

"See that fellow up there?" continued McIntyre, pointing to a tiny figure high up on the steel framework. "He must be all of thirty stories high, yet it's just like walking on the sidewalk to him. He probably feels safer up there than when he's crossing the street. But you'll notice there's one thing he never does. He never looks at his feet. He depends entirely upon his natural sense of balance.

Breath-taking Maneuvers in Space

"That man is a setter. He's perched at the edge of a beam with nothing below him but certain death if he drops. Watch that derrick maneuvering a new girder into place. Watch the way the setter is reaching out to bring its corner flush with the beam he's on.

"Now look at the way his pal—he's a bolter—stands up on the thin beam beside him. Doesn't it sort of take your breath away to see him straighten up on that narrow beam and walk over around the setter?

(Continued on page 127)

20,000 Silkworms Help Ford Duplicate Early Silk Mill

A workman in Henry Ford's replica of an early American silk mill is shown unwinding the thread from the cocoons as they soak in warm water. These cocoons are the size of an egg-shaped marble and yield up to 1000 yards of silk.

HENRY FORD, one of the most prominent exponents of mechanical efficiency in the world today, has turned to one of nature's oldest processes to help him re-create a lost phase of American industry.

Twenty thousand silkworms are now operating in a cellar in Greenfield Village, Ford's famous museum of early American life. They form the backbone of a tiny plant which faithfully reproduces an American silk mill more than a hundred years old.

The mill is operated by several men who spin, weave and dye the silk, converting it into the finished product. Only men's hose and scarves have been made thus far but more elaborate products are to be attempted.

The silk produced by the worms is made into hosiery with machinery built 130 years ago by Rodney and Horatio Hanks, in Mansfield, Mass. The Hanks plant was the earliest silk mill in the United States and operates today in Greenfield Village exactly as it did in the early 1800's when the Hanks family spun and wove silk clothing for the ladies of Boston and Cambridge.

When the urge to spin their cocoons is upon them, the worms work for three days and nights, spinning up to 1000 yards of silk.

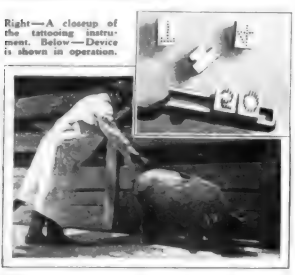
Novel "Branding Iron" Marks Pigs

BORROWING an idea from the western cattle roundups, hog raisers are marking their animals with a novel "branding iron."

Instead of burning insignia into the hide, however, the hogs are tattooed. A metal holder, about 18 inches long, is slotted to receive small blocks of babbitt metal in which phonograph needles are imbedded with their points protruding about a quarter of an inch. These needles are arranged to form the letters or numbers which make up the owner's identification symbols.

Ordinary black auto enamel is brushed over the needles and the hog is struck smartly with the device. The needles enter the hide, but it is said that the animal feels no pain.

The marks are clearly visible on a dressed carcass even when applied several months before slaughter and are a definite check on possible diseased meat.



Right—A closeup of the tattooing instrument. Below—Device is shown in operation.

Machine Tops and Pulls Beets

August Greenig, Iowa mechanic, is shown in his shop with machine which pulls and tops sugar beets in one operation.

A MACHINE which tops and pulls sugar beets in one operation has just been invented by an Iowa mechanic.

The topping device—its most outstanding feature—operates by means of a corrugated and adjustable roller, revolving at about two and a half times the speed of the drive wheels. This roller drags the beet tops back against two knives meeting in a "V," which are said to make a perfect cut since knives are adjustable to both high and low crowns.

Electric Recorder Finds R. R. Track Defects

Left above—Operator is shown clamping a mechanical stethoscope to car rail to determine extent of damage. Right above—Howard Meany, chief operator of the detector car, points out the system of rollers which reveal, by means of electrical impulses, the flaws in the track.

Photo shows the recording table in the car itself, where electrical impulses, working on radio principles, print a record of defective spots in track on a strip of tape.

NEWEST of the mechanical devices perfected by scientists to safeguard the traveling public is an electric recording machine which forestalls accidents by revealing defects in railroad tracks.

With the advent of the higher speeds demanded of modern transportation, the potential accident ratio has increased in direct proportion. The tiniest flaw or fissure in the steel rails may result in a major tragedy; but science has met the challenge of speed with a "detector car" which examines the rails, discovers their almost invisible defects and furnishes a record of the danger points.

How the Detector Car Works

Traveling at a rate of six miles an hour, the detector car passes over the section of rail to be examined. A series of highly sensitive rollers—the main "works" of the unique machine—maintain a continuous electrical contact with the rail, passing a current through the section under immediate observation.

As the rollers touch a defective spot, the flaw or fissure instantly sets up a barrier to the normal flow of the current. The resultant interruption is relayed to the recording table in the car above where the variations in the electrical impulses are imprinted on a piece of tape.

But although these tape-records are a highly important part of the process in locating the exact point of weakness in the rail, the remarkable device goes even further. Acting in conjunction with the instruments which first determine the defective spot is a gadget which automatically marks the weak point with a blob of paint.

An instrument closely resembling a doctor's stethoscope is then brought into action. Clamped to the rail directly above the weak spot, this stethoscope reveals the extent of the flaw or the fissure and serves as a final check on the findings which have been indicated by the electrical impulses registered on the tape recording device.

The results of the investigation are tabulated in the car itself, which serves as a recording room. Extensive experiments have proven highly successful and the detector car is being used by a number of large railway systems to protect travelers against possible accidents caused by defective rails.

Two Texas Youths Build Folding-wing Light Plane for $80

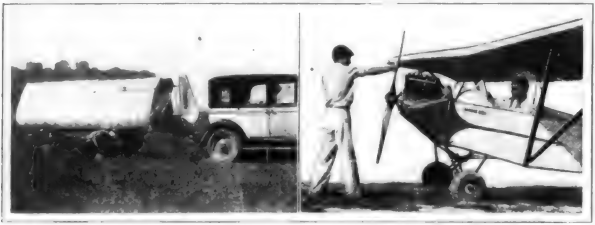


Photo left shows the home-built plane, wings folded, en route to the flying field. Right—Marlin Fischer is shown in the cockpit as his brother, Henry, spins the prop. The ship was built after two years' labor at a cost of only $80.

ONE method of solving the problem of hangar storage costs has been evolved by two young Texas flying enthusiasts with the construction of a light plane whose wings may be folded back in transit, permitting the plane to be towed behind an automobile to and from the flying field.

Christened the "Humming Bird," the tiny ship was built by Marlin and Henry Fischer in the back yard workshop of their home in San Antonio, Texas. Two years' work, plus an outlay of $80, were required to construct the plane. Powered by a motorcycle engine, the craft has been tested and found to be a satisfying performer in the air.

Although the ship presents a curious, knock-down appearance en route to the field, it is said that it may be reassembled in about half an hour's time.

Lighter Fits in Top of Pencil

Photo shows novelty pencil with handy lighter which fits in top.

ONE of the newest pocket novelties on the market is a combination automatic pencil and lighter which is said to be the last word in compact efficiency.

Fitting in the top of the pencil is a lighter which strikes like an ordinary match. The pencil itself is of the propel, repel and expel type and is fitted with an eraser and an extra supply of leads in the cap.

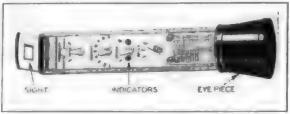
R. R. Diesel Engine Passes Tests

AFTER 700 hours on the test block, the first V-type Diesel engine ever to be used for high speed railroad service is ready for installation. The 12-cylinder engine develops 900 horsepower and with its generator weighs nearly 30,000 pounds. The engine will power a six-car train on a transcontinental run from Chicago to the Pacific coast.

This V-type Diesel engine is the first ever to be installed for high speed railroad transportation in America.

Gadget Assists Baseball Umpire

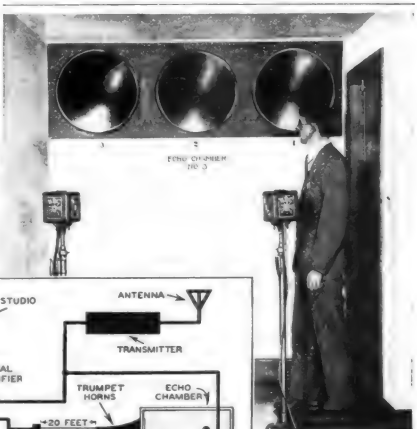
ACCURATE decisions on balls and strikes are said to be a simple matter with a modified telescope which baseball umpires may use to draw a bead on pitched balls. Indicators on the gadget also keep check on number of balls, strikes, outs and innings.



Sighting through eyepiece enables umpire to call balls and strikes correctly. Indicators check progress of game.

Radio ECHOES *Fake Convention Sounds*

Engineer shows sample of the concrete pipe leading sounds from the studio to echo vault.



Issuing from the horns shown above, sound waves are then bounced forth and back in this echo chamber in order to imitate convention sounds.

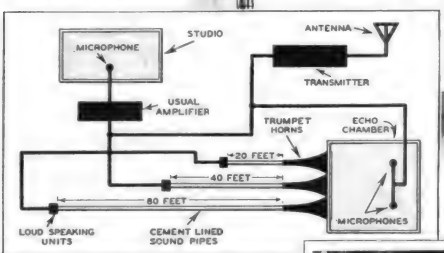


Diagram shows how sounds are led from regular studio through varying pipe lengths to the echo vaults. Length of lag is achieved by routing through the different pipes.

SOUNDS reproducing those of a convention in Madison Square Garden or a battle scene in the open country may now be reproduced in the smallest radio studio with a new "echo" system invented by a radio engineer.

When it is necessary to present a program punctuated by echoes or reverberations, the studio broadcast is picked up by the microphones in the usual way. The sound then travels to three loud speaking units, connected with three concrete-lined pipes, 20, 40 and 80 feet in length.

At the other end of the concrete pipes are trumpet-like horns mounted in the walls of "echo" chambers. As the sound leaves the horns, the concrete construction of the echo chamber bounces the sound waves forth and back, stepping up the echoes. These are then picked up by two microphones in the room, conveyed to the regular transmitter and sent out over the air.

With this echo control board, sounds from small studios are made to equal those issuing from huge auditoriums.

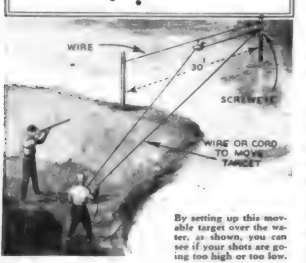
SPORTSMEN'S

Know the Fine Points

by **OSCAR QUAM**

Noted Minnesota Teacher of Duck Hunting

Oscar Quam, the author, here shows how to become a good shot by keeping both eyes open.



THE duck hunter who fires away at every duck in sight is not a sportsman. In fact he is ruining the sport for other hunters. He may wound ten birds a day and come home with only two. He may not bag his limit, but off in the reeds somewhere wounded ducks, far over his limit, die because he did not learn the finer points of duck shooting.

If you have spent a small fortune for a gun, boat, decoys, and shells, you should learn to use that equipment effectively and in a sportsmanlike manner. First you should learn how to use your gun. You should practice, not on ducks, but on targets that will show the results of your shooting and help you to correct your faults.

Few guns will bring down ducks past sixty yards. The most effective distance is forty yards. Therefore, judgment of distance is essential to the duck hunter. To bring down a bird flying 50 or more miles an hour it is necessary to fire ahead or "lead" the duck. Learning to judge this lead or space is also essential.

Learning to Judge Distance

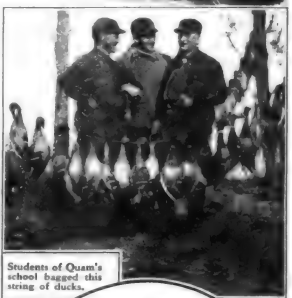
Training in these important factors of duck shooting is a simple matter. Place an object four feet long upright on the ground and walk away from it. Notice its apparent size at measured distances of 35, 45, 55 and 65 yards. Then hang the object in the air and study it from different distances. In this way a lead of four feet or more at any distance can be learned easily. The four-foot object is a good size because it is easy to estimate one-fourth or one-half of it to judge leads of five or six feet.

Writers have devised charts intended to show the newcomer in the sport the proper leads for different species of ducks. I do not recommend these because so many factors can upset these suggested leads as to make them practically worthless. Direction of the bird's flight and velocity and direction of the wind, as well as velocity and kind of shot in the shell, determine the correct lead. This can only be learned by practice and noting the effects of your shots.

A good target can be made by setting up two poles 30 feet apart in a stream or lake.

CAMPFIRE *of* DUCK *Shooting*

Does your gun show a killing pattern? Do you close one eye when you aim? What shot is most effective for your shells? These and other questions about duck hunting are answered here by a leading expert of the fascinating sport.



Students of Guam's school bagged this string of ducks.

Hanging the target over water is recommended because you can easily see where your shot lands: if ahead of the target, you are shooting low; if behind, the aim is too high. String a wire tautly between the two poles and on this hang a target about the size of the duck. Attach wires, as shown in the illustration, so that the target can be pulled back and forth.

With a target arranged in this manner you can stand at varying distances and have the target move toward you, away from you, or at right angles to your gun.

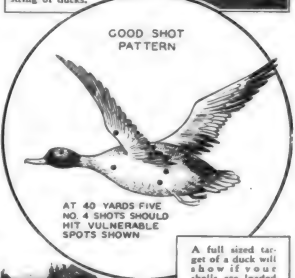
How to Become a Crack Shot

The usual method of leading is to aim at the duck and then swing the gun ahead of it the proper lead. I do not teach this method because there are too many unnecessary movements. Why not simply raise the gun the correct distance ahead of the duck without sighting the duck over the gun at all? In either case the hunter is shooting at an imaginary object ahead of the duck. When you see a duck flying, estimate its speed and the space to lead and then shoot at the imaginary object immediately. That is the only way to become a "quick shot."

Snap shooting is the best way to shoot ducks. The shotgun is not a rifle. The shot pattern of the 12-gauge covers an area 30 inches in diameter at forty yards. For that reason it is not necessary to aim the gun as carefully as a rifle. When firing a shotgun, do not close one eye and sight the other carefully over the barrel. Practice on your target by keeping both eyes open, pointing the gun at the target, and keeping the head erect without bringing the eyes to the level of the gun barrel. If the hunter can judge space and the speed of ducks correctly, he can become a crack shot with snap shooting.

Shooting in this manner the hunter has a clear vision of everything around him. Since he has both eyes open, he is not

(Continued on page 136)



A full sized target of a duck will show if your shells are loaded with the best shot.

The expert waits for the ducks on the windward side of feeding grounds. Flocks will come down streams or through low points of forest on shore line of lakes.

SPORTSMEN'S

How to Select Correct Ammunition For BIG GAME HUNTING

BIG game hunting is a sport that requires a knowledge not only of guns but of ammunition. If you know the energy, velocity, and patterns of a cartridge, you will not attempt to kill a deer with a bullet intended for squirrels.

It is not a good policy to use the small bore rifle or medium power rifles, such as the .25-20 and the .32-20 in the big game field. They produce only pencil like bullet holes which have a tendency to close up, permitting large animals to run long distances even though hit in a vital spot. For small game they are excellent, but their accuracy beyond 175 yards is doubtful.

The .25-20 sends an 86 grain bullet forward with a velocity of 1380 feet per second with an energy of approximately 360 pounds. The 100 grain bullet fired from the .32-20 attains a velocity of 1325 feet per second and produces 390 pounds energy.

The .30-30 for more than a half century has been popular with trappers and hunters in the north woods as an all-around big game rifle. It holds its own as a deer rifle and probably has killed more deer than several other caliber rifles put together.

The .30-30, the .32 Special and the .33 have been considered suitable for ordinary deer hunting, black bear and other brush shooting. They are considered inferior by many hunters for moose, elk and grizzly bear. For such big game it is well to select a cartridge producing from 2500 to 3000 feet muzzle velocity, with a succeeding energy from the muzzle to the mark at 100 yards of from 2000 to 2500 pounds.

One of the most highly recommended cartridges of the day is the .30-06. It has been widely acclaimed by all hunters the length and breadth of the country. It is very popular. The loads produced in this class are numerous ranging from the 220 round nose bullet for moose and like heavy game down to a bullet suitable for vermin shooting in the woodchuck class. The 180 grain open point boat tail bullet possessing 2700 feet velocity and with an energy of 2910 pounds has been strongly recommended as one of the best heavy game cartridges.

Another favorite big game cartridge is the .30-40 with the .276 keeping it close company. Such loads have the smashing power needed in bringing the animal down and do not break up as do the light bullets which possess great velocity and a high energy.

Hunter's Match Kit Has Compass

SEVERAL features of a new match kit make it suited especially for hunters, fishermen and campers. The kit is conveniently small and is waterproof. Fully loaded the match case will float in water. The cap of the kit is fitted with a compass. Should the outdoors man run out of matches he will find a sun glass in bottom of case.

This waterproof match kit features compass and sun glass.

Sight Shows Gun's Shot Pattern

The sight on guns; drawing shows pattern, lead at 40 yds.

A NEW sight that slips over the conventional gun sight aids hunters in judging leads and shot patterns. The sight instantly shows if most of the shot will strike the bird or be wasted. At 40 yds. the lead is two circles before ducks.

Kinks on Preparing HUNTING CAMPS for Cold Weather

You can be comfortable in the chilly days of fall if you follow these tips. A double tent can be warmer than a cabin; a lean-to, sleeping bag, and reflector, described here, are ideal for temporary camps.

FOR an autumn hunting camp or a permanent camp through the cold weather nothing can equal the idea of installing a tent inside of a tent. This simply involves using, as an example, a 7x7 sized tent for the inner one, with an 8x10 or somewhat larger tent, if possible, outside of it. The outer tent provides insulation and a guard against the wind, while the inner tent remains comfortably warm. With two tents thus arranged one is able to spend even a winter in comparative comfort in the woods, especially if the location of the tent is in a sheltered place, preferably facing south, with a dense thicket of spruce or pine on other sides to sheer off the north wind.

If possible a wood floor should be provided for the inner tent. It should be two or three inches above the ground with a heavy matting of balsam boughs laid under it. It is desirable that both tents have a framework over which the canvas can be drawn to make the tents rigid and proof against the winds. The framework can be made of two by twos, although poles, if joined neatly, will do as well. The canvas used in these tents need be no more than twelve ounce material.

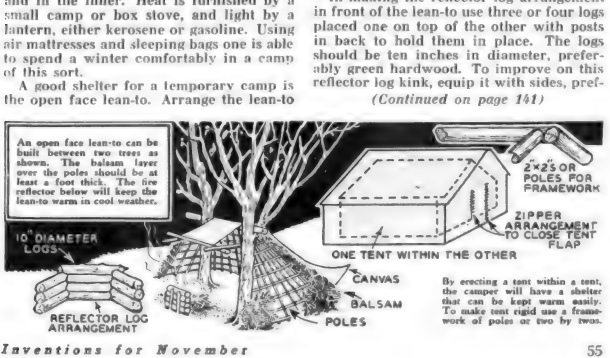
To yield light to the interior celluloid touring car curtain material can be arranged in windows both in the outer tent and in the inner. Heat is furnished by a small camp or box stove, and light by a lantern, either kerosene or gasoline. Using air mattresses and sleeping bags one is able to spend a winter comfortably in a camp of this sort.

A good shelter for a temporary camp is the open face lean-to. Arrange the lean-to in a sheltered place, as usual facing south. The lean-to may be a ridge-pole across the front between two trees and poles placed on a slant from the ridge to the ground. This is roofed over with a thick thatch of flat balsam boughs, laying them from the bottom towards the top. The thatch should be one to two feet thick. Slant the sides of the lean-to and thatch heavily also with flat balsam. This will leave only the front exposed. Here a fire is kept going with reflector logs so arranged as to throw the heat in on the occupants of the tent.

As an added protection against rain and to aid in sheering off the wind use canvas the width of the lean-to roof and extend it out three feet in front of the lean-to. This can be held in place by a pole at either end jutting out from the side of the lean-to with a pole attached to the front on which to tack the edge of the canvas. This front drop of canvas aids in catching the heat rays and reflecting them into the lean-to.

In making the reflector log arrangement in front of the lean-to use three or four logs placed one on top of the other with posts in back to hold them in place. The logs should be ten inches in diameter, preferably green hardwood. To improve on this reflector log kink, equip it with sides, pref-

(Continued on page 141)



New British Airmail Rocket Successfully Passes Initial Test

Photo shows loading of airmail rocket, preparatory to its test flight. Launched at Brighton, England, the rocket traveled two miles without damaging its cargo of mail.

ANOTHER step toward the establishment of rocket airmail was reached in England recently when a rocket perfected by Gerhard Zucker, German inventor, successfully completed a short test flight.

Carrying a load of 1200 letters, the rocket was fired from Brighton and made a two-mile trip without damaging its cargo. The letters were then removed and posted in the ordinary manner. Encouraged by results of the test flight, a British rocket syndicate is planning a series of extensive experiments.

Shop Is Built of Petrified Wood

BUILT entirely of petrified wood gathered from the nearby plains, the workshop of Mr. and Mrs. John Rafferty, of Lemmon, South Dakota, serves as a unique attraction for tourists and an unusual advertisement which helps to swell a brisk trade in curios of the plains.

Begun as a hobby, the collecting of the petrified wood has turned into a profitable business; for the unusual designs and colors of the wood have been utilized by the Raffertys for decorating trays, glasses, flower vases and similar objects. By careful selection of materials, a definite color scheme is obtained by blending the various tones in the original wood.

Top photo shows the unusual workshop constructed entirely of petrified wood by Mr. and Mrs. John Rafferty, of Lemmon, S. D. Below—The interior of the workshop, where the wood is made into trays, vases and other novelty objects.

Dog's Tail Forms Radio Receiver

This dog is a Great Dane in more ways than one. With an aerial attached to his collar and an ear phone hooked to his tail, he serves his master as a novel radio receiver.

A DOG'S tail serves as a radio receiver for Frank G. Kerk, Los Angeles experimenter. Kerk attaches an aerial to the collar of his Great Dane and hooks an ear phone to the animal's tail. The canine radio is then complete and all that is necessary is to place the phone to the ear and listen.

'Quake Squeezes Out Sand Flood

INVESTIGATING results of an earthquake in northeastern India, geologists discovered that earth pressures squeezed out a sea of sand which covered more than two thousand square miles of once fertile farm land. The action of the quake caused fissures in the surface through which a deeper layer of wet sand was forced in a devastating flood.

French Ship to Make Ice from Sea Water

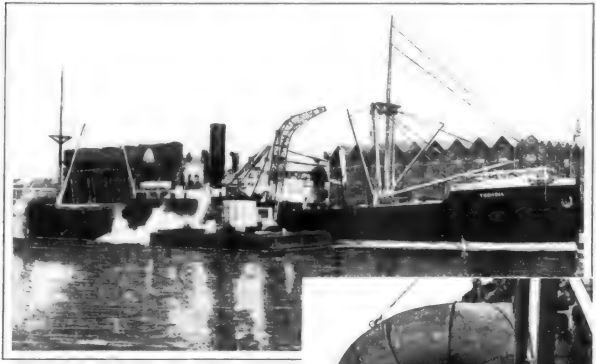
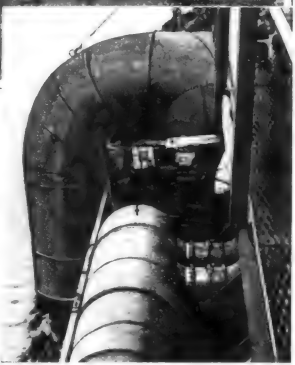


Photo shows the "factory ship," Tunisie, on which Georges Claude, French scientist, hopes to make ice from sea water.

BY PUMPING water from the ocean depths into his "factory ship," Georges Claude, noted French scientist, hopes to make artificial ice on a successful commercial basis.

Waters of the tropical seas off the coast of Rio de Janeiro have been selected for the experiment. The pipe will be attached to a float, with the ship moored alongside when the plant is working. The units are kept separate in order that the ship may have entire freedom of movement in the event of storms which might imperil the vessel.



A closeup of the huge pipe which pumps water from the sea depths. Experiments are being conducted off Rio de Janeiro.

New Voltage Indicator Developed

Indicator turns light to volts and back again to find voltage.

A VOLTAGE indicator which turns volts into light and light back into volts has recently appeared.

The indicator is connected to either an A.C. or D.C. circuit, the bottom placed over meter's photronic cell. Voltage is found by reading foot-candles on meter and checking against the conversion scale.

Robot Planes Make Air Targets

SEEKING to improve upon the old trailer target used in aerial gunnery, British authorities hit upon the scheme of patching up old airplanes for a final flight and making them serve as robot targets.

Each plane was fitted with a radio gear which controlled the ship's flight in the same manner as would a pilot. The targets were used to test a new spray-shot, high-velocity anti-aircraft gun which scored successful hits at varying heights ranging from 3,000 to 8,000 feet. In general, the ships fell after the second or third round of fire.

Revising the Map of America

Norris Dam and Muscle Shoals are the main projects of the government's gigantic experiment in the Tennessee Valley. Muscle Shoals, shown at right, was completed several years ago. Photo above shows excavation work on first cofferdam at Norris, Tenn.

To prevent floods and reclaim arid lands the government has undertaken such projects as those shown in photos. Boulder Dam will provide power, supply drinking water to California cities, and irrigate thousands of acres.

DISASTER threatens the United States. Productive farm lands are becoming desolate deserts. Cleared lands, where once stood thick forests, are being ravaged by destructive floods. Uncle Sam is in danger of losing hundreds of thousands of acres that are now helping to feed his 125,000,000 citizens.

To avert the threatened calamity the government is in effect revising the geography of the country. Where waste land now exists, happy farmers are expected to till a productive soil. Where flat prairies sweep to horizons on all sides, great forests will arise. Where rivers never existed, water will flow. Shallow, sluggish streams will become principal arteries of commerce. And, in some cases, where civilization rules today, a wilderness will exist tomorrow.

The disaster creeping upon the country reached its climax in the tragic drought of last summer. Although more devastating than expected, the drought has been foreseen for years by government experts. They watched rich, black soil being carried away by cloudbursts, floods, and strong winds. They discovered that 75 per cent of the cultivated land in the country was seriously affected by this soil erosion, that in all 17,000,000 acres have been destroyed beyond salvation, that this erosion carries away 126,000,000 pounds of plant food a year, and that the annual loss to farmers is $200,000,000 annually.

When the drought swept over the country, it left behind it damage amounting to

to Save a Nation

by WILLIAM DYCE

Cattle starved because of lack of pasture due to the drought. In Texas alone the government had to slaughter 1,000 cattle a day as shown in above photo.

The Mississippi river channel will open the river to cheap transportation as well as aid in controlling floods. Government seeks to check drought which was so severe Arkansas river became dry and farmers had to haul water miles for cattle.

$5,000,000,000. In all, 24 states, containing 27,000,000 persons and totaling 60 per cent of the entire area of the United States, suffered from the searing heat and the lack of rain. Thousands of acres of grain withered and died. Crops of corn, wheat, oats, barley, rye, flaxseed, and buckwheat were the smallest in 30 years.

Streams dried up. The Mississippi, Colorado, and Missouri rivers sank to the lowest levels on record. Water became so scarce that farmers traveled miles to get water for their stock and families. To save the land from thirst the government shipped thousands of gallons to the stricken areas by pipe line and railroad tank cars.

When pastures became dry tinder and cattle slowly starved, the government stepped in to buy one-sixth of all the cattle and one out of every ten sheep in the land. Of the 67,532,000 cattle in the country, the government set out to buy 10,000,000 from suffering farmers. Thousands of these cattle were shipped to good pasture lands to be fattened for market. Thousands of others were in such condition that they were killed on the spot. In Texas alone cowboys shot 1,000 starved cattle a day.

These were shipped to the nearest packing plants where the carcasses were converted into canned meat for the needy, in many cases the farmers who raised the cattle. Their crops and cattle gone, almost 4,000,000 people had to turn to the government for aid. In a few months the government had spent $160,000,000 of a $525,000,000 relief fund to help these sufferers.

To a certain extent the crop reduction program, instituted by the government last spring, was an attempt to forestall the danger that threatened American agriculture. Droughts may be phases in nature's cycle from plenty to scarcity, but their ravages are increased by man's lack of foresight. Dry land, that always should have remained range country, was tilled reducing its ability to hold moisture and support plant life. Laid bare to hot, dry winds it was robbed of the moisture that once created rains in the country and finally the land itself was carried away in the form of dust storms. There remained only shifting, desolate desert sands, unable even to support the

Huge Projects Will Reclaim Deserts, Stop Floods and Produce Rain

Map shows outstanding government projects which will change character of country in many sections. To control crop production farmers will be asked to stop tilling 50,000,000 acres, an area equal to all New England states.

Thousands of cattle were driven from parched drought-stricken areas to grazing lands in the southern states.

buffalo grass that once covered the prairies.

In many sections the most valuable crop was raised year after year on the same soil until its productiveness for any crop was ruined. The American domain was so vast that farmers, finding their soil becoming poor, simply cut down the forests on their land, planted it with corn, wheat or cotton, and renewed the process of soil destruction. The forest gone, the land was unable to hold back moisture and when spring rains came floods swept the country carrying away with them to the sea more valuable soil of the land. In Tennessee, government experts found that one rainstorm washed away thirty-nine tons to the acre.

To stop destruction of land and the decreasing price of staple products from these lands, the government instituted a crop reduction program. Of the total 350,000,000 acres of farm land, 43,750,000 acres, an area larger than all the New England states combined, was to be retired. The government paid farmers from $10 to $17 an acre for every parcel of land on which they stopped growing wheat, corn, cotton, or tobacco. Of the average wheat farm of 30 acres, four were to be retired.

In an effort to stop droughts and floods and to restore the fertility of the soil, farmers in the western corn and wheat states were advised to plant trees on the retired land; in the southern cotton states, they were urged to raise garden crops for the use of their families and to plant pulpwood trees near rivers; and in the tobacco sections to convert the land into pastures.

In addition the government is expected to retire an equal area, 50,000,000 acres, and let it become a wilderness. After a tour of inspection Reclamation Commissioner Elwood Read declared that the western half of the Dakotas, eastern Montana and Wyoming should be abandoned and planted with buffalo grass. The government is ready to spend $25,000,000 to move families from unproductive areas to better land.

(Continued on page 133)

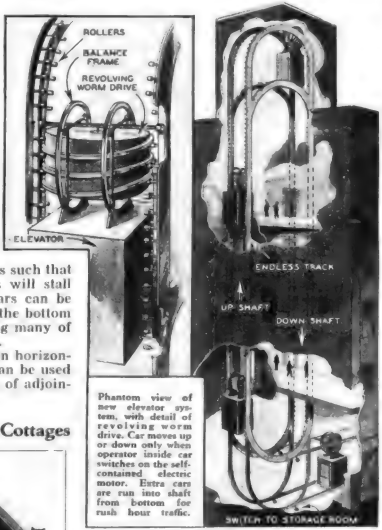
Elevator Climbs, Descends Endless Shaft Without Cables

INSTEAD of operating from the usual cables, a new type passenger elevator patented recently climbs up and down entirely by its own power. The car passes over the top from one shaft to another on an endless track, permitting as many as fifty cars, depending upon the height of the building, to run in one shaft.

The height to which the new car can travel is unlimited; in the cable type elevator passengers must change cars after about 70 stories. There is always danger that long cables will break of their own weight.

The angle of the worm drive is such that in event of motor failure, cars will stall without falling down. Extra cars can be run into the endless shaft from the bottom for rush hour traffic, eliminating many of the elevator shafts now required.

Since the new elevator runs on horizontal track as well as vertical, it can be used to interconnect elevator systems of adjoining buildings.



Phantom view of new elevator system, with detail of revolving worm drive. Car moves up or down only when operator inside car switches on the self-contained electric motor. Extra cars are run into shaft from bottom for rush hour traffic.

"Animal Town" Has Cat Cottages

Two of midget two-room cottages built for cats on English humane society's "little animal town" are shown above. Homes are now ready for 60 to 70 feline occupants.

BETWEEN 60 and 70 cats are getting their daily bread and milk in tiny two-roomed cottages located in a "little animal town" in Surrey, England.

The Royal Society for the Prevention of Cruelty to Animals has bought 6½ acres of ground for this little animal settlement, which when finished will provide homes for over 300 cats and hundreds of other animals.

Liveried attendants prepare special cat-diets when necessary.

Comedian Builds Own Speed-Car

AN ULTRA-MODERN roadster designed and built by Ralph Cook, noted comedian, has many attention-catching features.

Fenders have been dispensed with, mudguards or "pants" being substituted. There is no clutch pedal, and the brake is operated by the left foot rather than the right.

Though capable of doing 96 m.p.h., gas consumption of the car is said to be better than 29 miles to the gallon.

Glistening chromium plates built on a slant in front of the radiator add a bizarre touch to the stream-lined design.

With series of planting steel plates at front of radiator, steel fin at rear, an aero-dynamic speed car built by Ralph Cook, noted comedian, in spare time attracts admiration of crowds wherever it is parked or driven.

Harpoonists Spear Flying Fish by Searchlight off Catalina

Armed with short harpoons, these fair sportswomen are shown spearing flying fish off Catalina Island, California.

Hydro Plant Supplies Farm Power

OPERATING without batteries or other electric controlling apparatus, a new hydro-electric plant for small streams solves the problem of farm or suburban power where at least eight head feet of water are available.

The unit is vertical, direct-connected and is furnished complete with power house, framework, inlet valve, self-contained governor and all other necesary equipment. There are no gates or links under water. The plant is automatic in operation and is said to be devised especially for those with little experience. The unit is constructed for use with either direct or alternating current.

Photo shows hydro-electric unit for small streams. Note the vertical construction, making working parts accessible.

OFF Catalina Island, "where the flying fishes play," outdoor men and women have invented a new and fascinating sport.

Powerful searchlights are mounted in the bows of sea-going speedboats. As the sturdy craft cleave the waves, huge swarms of flying fish rise like enormous sea moths into the rays of the brilliant lights which cut through the darkness.

Armed with short harpoons, to which a retrieving cord is attached, men and women crowd the rails of the speedboat. A quick thrust of the harpoon, and the flying quarry is bagged in mid air by the skill of the fisherman-hunter.

The fish are good eating and their filmy wings are used for a variety of decorative purposes.

English Perfect Tail-Less Plane

This tail-less British fighting plane does away with the blind spot which formerly hampered fire of the rear gunner.

DESIGNED primarily for aerial combat, a new British fighting plane overcomes a dangerous blind spot by eliminating the fuselage and tail unit behind the wings. This construction provides the rear gunner with a fine field of fire. The upper wing is of the tapered, swept-back type. The ship is controlled by balanced flaps on the upper wing. Worked together, they serve as elevators; operated differentially, as ailerons.

Model T Generator Powers Drill

COMPLETE sets of parts for converting an ordinary model T Ford generator into a heavy-duty electric drill operating on 110 volts A.C. or D.C. have recently been placed on the market. Special gearing reduces the motor speed to 370 revolutions per minute, giving sufficient power to handle up to ¾" drills. Aluminum castings are used throughout.

How Ford generator is converted into heavy duty power drill.

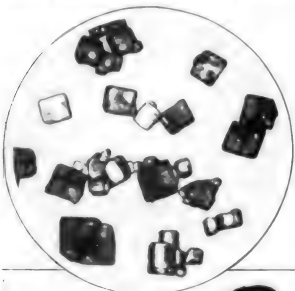
New Scale Features Home Aids
DOUBLE SHAKER
WRINGER GUARD
saves housewives' fingers by means of a "mechanical hand" which feeds clothes to rollers of wringer.
SCALE
COFFEE

Probing KITCHEN *Secrets*

PROBABLY the last place in the world to be associated with mystery by the casual observer is the common household kitchen; yet to the scientific sleuth, armed with a microscope, it is a natural wonderland of strange and exciting phenomena.

Under the magic eye of the microscope a grain of salt does a disappearing act worthy of a Houdini; thousands of familiar objects reveal themselves in new and startling form; prosaic, everyday foods that line the pantry shelves tell an unbelievable story of physical and chemical change.

Everyone knows that federal agents enforce inspection of packing houses, canneries and factories to insure purity of all products offered for public consumption. Yet, few know that the compound microscope is the principal factor in determining adulterants and impurities. Since inspectors employ this instrument in analyzing food products, you may do likewise in your kitchen laboratory.



Testing Your Breakfast Cereals

Select some of your favorite breakfast cereals, for example, and examine them to see what they really contain. Soak up a single corn flake in a watch glass of water, and after several hours, further disintegrate the flake by pulling the shreds apart with two needles, an operation called *teasing*. Transfer a small amount of the resulting debris to a slide, with a drop of water, and put on a cover glass. Do not have the material too dense or thick. Starch grains may be seen and compared with a model series in order to determine whether this food contains wholly corn or has other cereals in addition. Are plant fibers abundant? These constitute roughage and, while their presence is both necessary and healthful, they should not predominate if the given breakfast food is to have nutritive value.

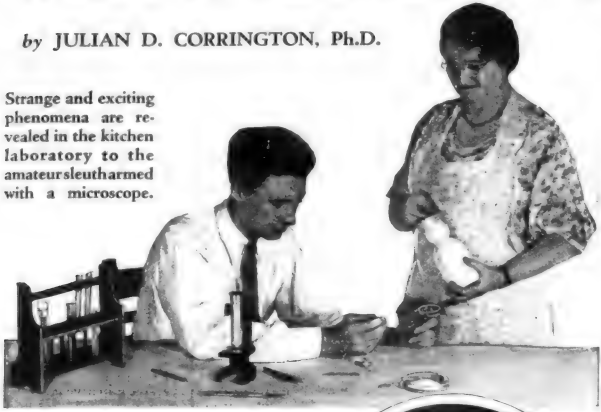
Put a drop of milk under your lens and observe the numerous oil globules that float about under the cover glass. Compare with diluted canned milk and also make a thin film of gently warmed butter, and others of lard, oleomargarine, salad dressing and mayonnaise. The relative abundance of fat

Circle insert shows salt crystals magnified 50 times. Left above—Examining the solubility of sugar under the eye of the magic lens. Right—This is not a specimen of blown glass, but common mildew, bane of the housewife's existence.

WITH A MICROSCOPE

by JULIAN D. CORRINGTON, Ph.D.

Strange and exciting phenomena are revealed in the kitchen laboratory to the amateur sleuth armed with a microscope.



Observation of the number of oil globules in a drop of milk enables operator to estimate relative food value.

globules in a given amount of material will give you some notion of the food value in these various substances.

To make a detailed analysis of foods and chemicals, somewhat extensive knowledge is required, of course, but the foregoing examples will give an idea of the possibilities in this form of work. Those with sufficient background will enjoy studying mounts of the kitchen chemicals, such as salt, baking powder and soda; of the ferment, yeast; of such fluids and emulsions as soap, India ink, bluing and paint, all diluted with their proper solvent; and of such condiments as black pepper, white pepper, nutmeg and allspice.

Making Chemical Crystal Mounts

Permanent mounts of chemical crystals are prepared with ease and form a fascinating study since glimpses of the process of crystallization itself may be observed under the lens. Take common table salt—sodium chloride—for instance. Put two drops of water on a slide and add a few salt crystals, then a cover glass. By the time you mount and inspect this slide, no salt crystals can be seen; they have dissolved and disappeared, forming a solution of salt in water. If the salt is added while one looks through

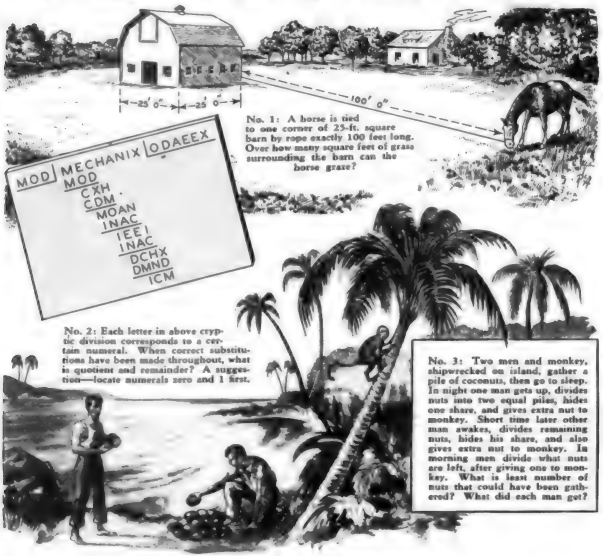
An efficient microscope lamp may be made in the home workshop from an old coffee can. See text for details.

the tube of the microscope, without using a cover glass, it may be possible to secure a fleeting glimpse of this magical disappearance.

What is it that really takes place? We know that sugar will vanish in the same manner, but that particles of clay, starch or carbon will not—in other words are insoluble. What is the difference between

(Continued on page 134)

$25 PRIZES for Solving 3 Easy PROBLEMS



THIS month's problems involve only simple geometry and algebra. There's no need to carry out the first problem to more than ten decimal places.

For the neatest accurate solutions to all three problems MODERN MECHANIX AND INVENTIONS offers $25 in prizes, as follows: First prize $10; second $5; and four third prizes of $2.50 each.

Contestants must give age, occupation, and education, though this information will not be considered in awarding prizes.

Your entry should be postmarked before October 25, 1934. Decisions of the judges will be final, and no entries will be returned. In case of ties, duplicate prizes will be awarded. Answers and names of winners will appear in the January, 1935, issue.

Employees of this magazine or members of their families are not eligible to compete. You don't have to buy a copy or be a subscriber to enter. Address M-M Contest Editor, 529 So. 7th St., Minneapolis, Minnesota.

September Puzzler Contest Winners

NEATNESS of entries proved a big factor in the judging of the contest in the September issue since several entries were correct. The answers are: No. 1—the fish is 24 inches long; No. 2—the quotient of the cryptic division is 196051, with a remainder of 266; No. 3—the area of the shaded portion is 1/6 XY.

First prize of $10 goes to Henry M. Bettman, San Francisco, California—his entry was made up in book form, with a neatly printed cover.

Second prize check for $5 was sent to Kenneth Swan, Newcastle, Indiana. Four third prizes of $2.50 each were awarded to George W. Freeman, Liverpool, New York; Ray Coney, Alameda, California; Harold Hay, Gananea, Sonora, Mexico; and Richard F. Beardsley, Chicago, Illinois.

Send in your own ideas for future contest. If accepted, you will be paid for them.

Lighted Radio Map Traces Planes in Flight Across Country

BY RECORDING the continuous flight of a plane on a sectionally lighted map operated by a short wave radio, a former naval officer hopes to eliminate air crashes.

The sound of a plane's propeller activates the lights. If the plane approaches a mountain range in a fog, the pilot is warned by phone to alter his course. Should the motors fail, the last light burning on the map indicates where the ship was forced down.

The apparatus consists of a binaural plane direction indicator, radio distance recorder, short wave receiver and 1000-watt transmitter.

Photo shows Dr. Samuel Spitz, former naval officer, at control panel of his flight recording device, seen as a boon to aviation. Lights on the map overhead indicate exact position of the plane throughout its entire flight.

Pipe-Shaped Cigar Lasts Longer

Newest of smokers' novelties is pipe-shaped cigar shown above, recently introduced in America.

A NOVELTY smoke, now on the market, is a pipe-shaped cigar which is said to last three times as long as those of ordinary shape.

The unusual design of the cigar moreover is said to retain the ash intact, making the aroma more enjoyable. Recently brought to America, the cigar originated in Europe.

Device Checks Gas Can Explosions

PLACED inside a gasoline container, a new device prevents an explosion in case of fire, according to its inventor, William Horn, of Winnipeg, Canada. Although tests have been successful, the inventor has had difficulty in persuading business men to witness his demonstrations at close range.

A Canadian inventor demonstrates his anti-explosion device by holding a can of gasoline in the midst of the raging flames.

Compound Prevents Timber Decay

WORKING on the theory that decay in construction timbers starts around the bolt holes, an inventor has evolved an apparatus designed to eliminate this hazard by forcing a preservative under heavy pressure into the wood cells of the hole.

The device consists of a pump which is screwed into the bolt hole and capped on the other end. The preservative is then poured into a cup and forced into the wood cells by working the plunger back and forth. Pressure of 120 pounds per sq. in. is obtained.

Photo shows pump used to force preservative compound into bolt holes to prevent decay of heavy construction timbers.

Find Radio Layer 1000 Miles Up

SCIENTISTS have discovered a new "refracting region" 1000 miles overhead which reflects radio signals back to earth. Previously the greatest known height for such layers was estimated at about 500 miles. The new figure was arrived at by means of a photographic drum. Outgoing radio signals registered one dot on the film, the echo another. The distance between the two dots revealed how far the signal had traveled.

Newsreeler Shoots Bike Races From Speeding Motorcycle

Photo shows novel camera mount devised to photograph six-day bicycle race. Note crash helmet worn by cameraman.

THE problem of securing continuous action scenes of a recent six-day bicycle race in Los Angeles was solved by mounting a movie camera on the rear end of a speeding motorcycle.

A rigid camera mount was secured directly over the rear wheel with the operator perched back-to-back with the driver of the motorcycle. By traveling in a direction opposite to that taken by the bike racers, the cameraman was able to secure a series of novel and thrilling closeups.

The success of the experiment was marred, however, by a serious crash. As the camera machine sped around the track photographing racers who were pedaling furiously in the other direction, the front wheel of one of the bicycles collapsed and the racers piled up with the motorcycle.

Young Miners Invent Gold Sluice

BY UTILIZING their inventive genius, two brothers are collecting gold-dust dividends from the Rogue river, near Grants Pass, Ore., with a home-made gold sluicing machine which employs the old principle of the waterwheel.

Gallon cans attached to the paddles of a huge wheel carry the river water to the top of a series of troughs and thence to shore and the head of the sluice boxes into which the brothers shovel the gravel and recover the gold dust. The wheel, troughs and riffle boxes were built entirely by the two boys, who have developed a profitable sideline as a result of their labors. Operations net the young inventors from two to four dollars daily.

Home-made device which washes ore-bearing gravel and recovers gold dust from river near Grants Pass, Oregon.

Pack Reduces Doughboy's Load

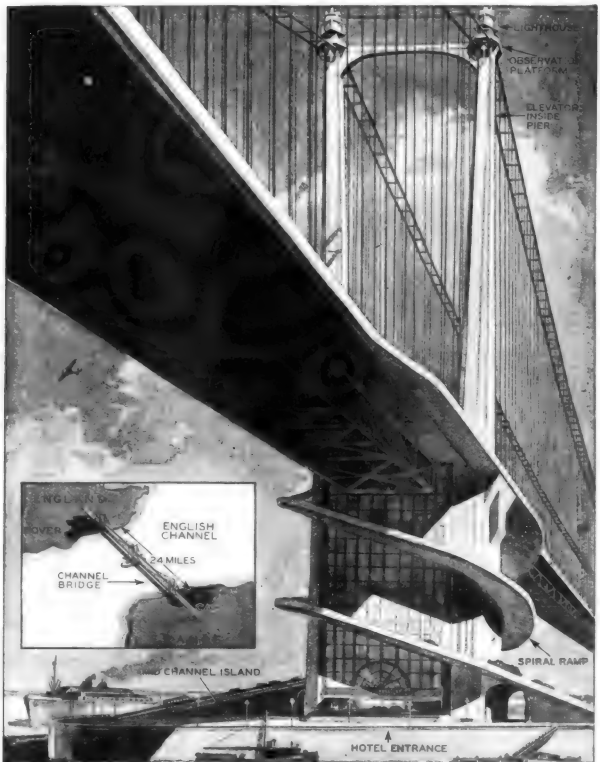
Note difference in new and old style packs shown above which cut weight from 79 to 16.3 pounds. Soldier at left wears the field jacket which replaces the old overcoat.

TO INCREASE the mobility of foot soldiers, a new army pack has been invented which substantially reduces the doughboy's load.

During the World War the infantryman carried a load of 79 pounds on his back. With a new pack and substitute for the overcoat recently perfected by Sergeant Nicholson of Headquarters Company, Washington, D. C., the soldier's load has been cut to 16.3 pounds, while still supplying all needs in the field.

Shelter tent, poles, pins, rope and underwear have been eliminated and a new field jacket replaces the cumbersome overcoat. A bedding roll which forms a zipper-closed sleeping bag, made of light, rainproof material provides even greater comfort and security than the former pup tents. In combat the roll may be dropped in two seconds, leaving the soldier unencumbered in battle.

Giant CHANNEL BRIDGE *Planned to Link* FRENCH *and* ENGLISH *Coasts*



Above is a striking illustration of the huge structure by means of which a Polish engineer proposes to span the English Channel. The bridge would serve as a giant motor highway between France and England and would be of the suspension type, following the general lines of the famous Brooklyn bridge. At the midway point, an island would be built of steel and concrete, serving as a center pier. Cable towers rising from this island could be surmounted by lighthouses to guide steamer traffic and be equipped with observation platforms reached by elevators within the giant towers.

What Happens

BEHIND THE SCENES AT

Government demands for gold have spurred mining activities in both old and new diggings. The photo above shows a group of miners, armed with rock hammers, at work in a large Colorado gold mine.

Before raw gold may be accurately assayed, each batch must be heated in a furnace (see top photo) until all parts are exactly alike. Dross is burned out under temperatures ranging from 1200 to 2000 degrees Fahrenheit. Below—Assay workers are shown weighing consignments. Double checked weights guard against error.

EVERYONE knows that under the present laws new gold finds its way almost directly to a government mint. And in a general way we all know that in these mints placer dust, nuggets and crude smelter bars go through some mysterious process before being made into money or placed in vaults as monetary metal reserve.

Few people, however, have an opportunity to follow the precious metal on the trail it travels after it leaves the mine, mill or smelter and reaches the hands of Uncle Sam's money makers. One reason for this is that there are only ten mint-service institutions in the country. Of these ten, only three make coins, Philadelphia, San Francisco and Denver; and only the two last named carry on the complete process of melting, assaying, refining or coining.

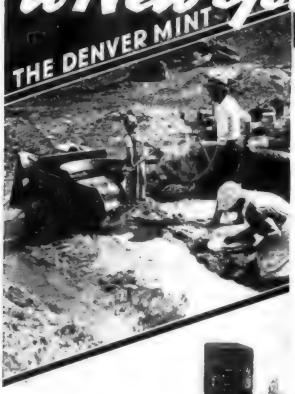
No Sightseeing at the Mint

Formerly it was an easy matter to go through the Denver mint; in fact, sight-seeing parties were frequently allowed to "rubber-neck" through the building, always under the watchful eyes of guards. It was an old mint custom, to allow people to see where dimes and double eagles come from. This custom started before the days of big-time gang mobs—and stopped emphatically after a sensational robbery in which about a third of a million dollars were stolen and both guards and gangsters were killed in a savage gun battle. Today nobody gets inside the heavy, locked doors unless

to New Gold?

THE DENVER MINT

by ARTHUR H. CARHART



Top photo—Family prospecting with mechanical gold pan. Below—Old coins which are to be re-minted.

the guards are certain that the visitor has good reasons for being inside the mint.

As gold comes from the mine, mill or smelter, it enters the first of two divisions of the mint, the deposit division. This is a sort of "Ellis Island" for the monetary metal going into our treasury reserves. Once in that division, it never gets outside the rooms until all checking, weighing and assaying is finished. The same vigilance is practiced in the melting and refining division. No metal leaves the department until it is coined or cast into bars that are put in sealed vaults. Thus there is positive responsibility and accounting for the treasure at all times.

Weighing the Rough Gold

As the rough gold is brought in it is carefully weighed. Here it is given a batch number which it retains until it is finally merged with many other batches in the melting and refining division. The gold may be placer grains, dust, native nuggets, the coppery "button" from distilling mercury amalgam, or it may be in the form of small bars of nondescript sizes and degrees of purity.

The purity of gold is measured on the scale of 1000. Thus a bar of gold that has 865 parts of gold in every 1000 units of bar, would be said to have a fineness of .865. "Certificate bars," which are the nearest thing to pure gold obtainable, are designated as 999.99 fine. Usually there is a small amount of silver in combination with gold as it comes in, but this silver content aids in the processing. Bars coming from big refineries may show a fineness of 995; but

(Continued on page 122)

Seeking the elusive mother lode, an old-time prospector sets out with his pack train. Where feed is plentiful, horses are used, as shown above, instead of burros.

Sculptress Models Novel Desert Dwellings

Photo at left shows an unusual model of a church designed by Helen Zelezny, Czecho-Slovakian sculptress. Above—The "family house" of a wealthy merchant in Tunis, Africa.

COMMISSIONED by a wealthy merchant of Tunis, Africa, to design an unusual house, a Czecho-Slovakian sculptress responded by incorporating giant facsimiles of the features of household members in the exterior of the dwelling.

The merchant has two daughters, a son-in-law and a grandson, all of whom are shown in mammoth relief in the lines of the unusual structure. The eyes and mouths of the huge figures serve as doors and windows.

The unusual design was conceived by a Czecho-Slovakian artist, Mrs. Helen Zelezny.

Fossil "Mine" Found in Montana

NEAR Billings, Montana, scientists of the American Museum of Natural History have discovered one of the largest "fossil mines" ever found in this country. A preliminary survey has revealed at least eight separate dinosaur skeletons, with indications that more will be found. The age of the fossil discoveries is estimated at about 125,000,000 years. Investigations to date reveal that some, if not all, of these dinosaurs belong to a hitherto unknown species.

Phone Stand Conceals Memo Pad

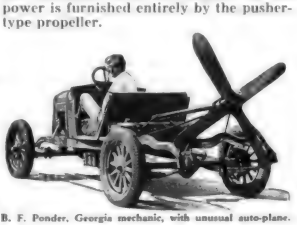
Drawer in base of stand opens to reveal memo pad and calendar.

A NEW telephone stand is fitted with a drawer that springs open at touch of a button, to reveal a good-sized memo pad and calendar, ready for instant use.

The device eliminates unsightly pads or rolls of paper. Stand is made of bakelite.

Prop-Driven Car Makes 85 M.P.H.

BY MOUNTING a four-bladed airplane propeller on an auto chassis, a Georgia mechanic has evolved a combination vehicle which has attained speeds of 85 miles an hour. The wheels of the auto-plane are not connected with the engine. Motive power is furnished entirely by the pusher-type propeller.



B. F. Ponder, Georgia mechanic, with unusual auto-plane.

Italian Speedboat Dodges Own Torpedoes in Sea Attack

DODGING at terrific speed through ship blockades to launch death-dealing torpedoes, a tiny but powerful speedboat developed recently by the Italian navy is expected to revolutionize naval offensive maneuvers. Though directly under the heavy guns of enemy battleships, the tiny craft is expected to be elusive enough to escape.

The new boats are similar in appearance to the midget torpedo boats used by Great Britain in the World War, but are capable of much greater speed even in heavy weather.

The two torpedoes are slid back over the stern as the boat dashes at top speed directly towards the target. Swinging in a wide arc out of the path of the onrushing torpedoes, the boat dodges back to its mother ship, leaving the missiles to travel on to the target.

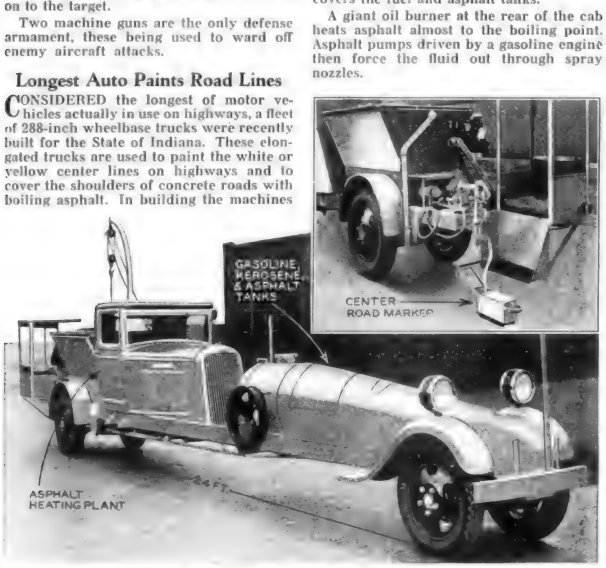
Two machine guns are the only defense armament, these being used to ward off enemy aircraft attacks.

Photo of new Italian torpedo speedboat. With boat heading for target, torpedoes are slid back over stern. Craft then dodges onrushing torpedoes to return to mother ship.

Longest Auto Paints Road Lines

CONSIDERED the longest of motor vehicles actually in use on highways, a fleet of 288-inch wheelbase trucks were recently built for the State of Indiana. These elongated trucks are used to paint the white or yellow center lines on highways and to cover the shoulders of concrete roads with boiling asphalt. In building the machines a standard truck chassis was extended and squeezed in to make the truck no wider than an ordinary car. The forward hood, resembling somewhat an airplane fuselage, covers the fuel and asphalt tanks.

A giant oil burner at the rear of the cab heats asphalt almost to the boiling point. Asphalt pumps driven by a gasoline engine then force the fluid out through spray nozzles.



One of fleet of vehicles used by Indiana state highway department. With wheelbase of 288 inches and 36-inch tread, no wider than ordinary car, truck offers minimum traffic hazard when marking center lines. Masts are sights used by driver.

Stunting Motorcyclist Rides Built-up Motor Bike on Stilts

Perched on a seat three times its normal height, this English motorcyclist used long stilts to reach foot controls.

DEFYING the laws of gravity, a human giraffe recently thrilled spectators at an English charity carnival by riding a built-up motorcycle whose framework was so high that stilts were necessary to reach the foot pedals.

The last word in vertical streamlines, the odd machine was devised as a comedy number in a motorcycle show. Perched upon a seat raised to about three times its normal height, the rider manipulated his mount through extension controls running up to the handle bars. A common one-cylinder engine furnished the motive power.

Surfboard Rescues Sea Victims

SURF and high seas are no obstacle to the launching of a new lifesaving device which has just been given a successful demonstration.

Designed somewhat like a surfboard, but larger and thicker in size, the device has a hollow, re-enforced center running its entire length and can cut through any kind of surf at a speed of 200 yards a minute. The drowning victim is laid in the center well of the board which is hand-propelled by the guard, from either the straddle or prone position.

Top photo—Guard is paddling victim to shore on life-saving board. Below—Demonstrating lightness of the device.

Army Car Has Bullet-Proof Tires

FIVE tons of bad news for Uncle Sam's enemies are represented in a new army machine on whose armored sides and special tires ordinary bullets have no effect.

The tires are filled with a special sponge rubber and have traveled 1400 miles after having 50 rounds of bullets fired through them. In addition to a quota of machine guns, the car is also radio equipped. The car was recently exhibited to the public at Camp Roosevelt at the World's Fair.

Ordinary bullets make no impression upon this armored car. Sponge rubber tires have withstood 50 rounds of bullets.

Infra-Red Film Aids Surgeons

THE discovery that the human skin is somewhat transparent to infra-red rays has developed remarkable results in surgical science by the use of an ordinary camera equipped with infra-red film.

Through the use of this special film, the rays reflected from below the skin's surface are easily picked up by the lens. Thus, large blood vessels, lying close to the surface, are shown in all their detail, permitting study by the physicians. Solids retain their normal appearance, the veins appearing as dark tracings against a white background. By this method, doctors will be able easily to detect varicose or obstructed veins.

NEEDED INVENTIONS

Chain stores offer a splendid market to the inventor of picnic accessories and household items. Patent information may be obtained from Patent Editor, Modern Mechanix and Inventions, 529 South 7th Street, Minneapolis, Minn. Send stamped, return envelope with your request.

THE American chain store has been a tremendous factor in the introduction and successful exploitation of hundreds of little household and workshop inventions. Here we find the mass sales to meet mass production. Every inventor who wants to make a quick fortune will do well to consider this outlet and to keep his selling price within the scope necessary to reach this appalling market. It is also advisable for the inventor to interview the local store manager before he spends his time and money in the development of his idea. These men have a keen and, at times, uncanny sense of what the public of this country buys.

Paper Cups With Handles Needed

One of these bright young store managers gave the author a number of ideas for little things which would have immense possibilities and with the hope that some of our ingenious readers might be able to find answers to these problems they are outlined below.

Since the introduction of the low-priced automobile, America has become a land of picnickers and campers. What's more, practically every picnicker is a hot dog eater. Although those who have attempted to cook hot dogs over open fires realize the difficulty of the task, we have as yet no device developed especially for this use. What is needed is a simple wire form of some kind which will grip the hot dog firmly and prevent it from dropping into the fire, a danger always present when a fork or a twig is used for this purpose.

Motorists Want Car Screens

There is still another picnic item that would make a great deal of money for its inventor and the writer refers to a paper cup with a handle. True, we have such cups but they are costly to manufacture and what is needed is a design for a cup that can be blanked out in one piece and which, when folded or rolled into the proper form, will be provided with a handle. Surely somebody can do that.

Who has not seen the exasperated housewife making waffles with an elec-

(Continued on page 142)

Lighthouse Surveyors of

by

JAMES NEVIN MILLER

ON THE crest of one of Alaska's highest mountains, in the very heart of Glacierland, a single white man serves as sole custodian of the queerest type of lighthouse in the world.

Barely large enough to house one man, this lighthouse is nothing more than a tiny umbrella tent which contains a new type of electric signal lamp operated by dry cell batteries. This lamp throws a beam 150 miles across the blackness of the northland nights. Its cheerful rays spell safety to other lighthouse keepers stationed on the tops of other ice mountains within a radius of perhaps 50 miles; and its cryptic messages trace for science a revolutionary way of surveying sections of Alaska which hitherto have been in dispute by boundary

One of the lighthouses used by surveyors to map the Alaskan wilderness.

In order to avoid unnecessary duplication of labor over the rough Alaskan slopes, all instruments and equipment are packed in a single trip. Often weighing 80 pounds, the packs contain sufficient bedding, food and equipment for a stay of about ten days. Note extreme roughness of terrain and the degree of climb shown in the photograph above.

Alaskan ICE WASTES

commissions of the U. S. and Canada.

Ever since 1867, when Alaska's tremendous area of 590,884 miles became American property, our government has been confronted with the perplexing problem of how to devise accurate maps and charts of her jagged shore line, outlying islands, hills, mountains and streams. Surveying has been well nigh impossible. Treacherous glaciers with slippery surfaces and yawning chasms, mile upon mile of almost impenetrable timber, swollen streams and heavy snowfalls—all have combined to complicate the surveyors' tasks.

Land Lighthouses Aid Surveyors

But the new "land lighthouse system," requiring fewer men than other methods, plus less expenditure of time and money, has paved the way for Uncle Sam to make Alaska's hitherto puzzling geography familiar to all the world for the first time in history.

The whole procedure is an ingenious adaptation of the Coast and Geodetic Survey's so-called "triangulation system." For the land lighthouses provide excellent points of observation for topographers of survey parties in the making of those base lines upon which all surveys rest.

Just what does the term, triangulation, mean? It consists, the government experts explain, of the determination of the relative positions of the earth's surface by means of a series of points distributed throughout some extensive area. That is to say, this work furnishes latitudes and longitudes of fixed points called triangulation stations. From this data the distances between any two stations in the triangulation net can be computed. These points then become the basis, or the framework, for the maps made by the government's various mapping organizations and for engineers in private practise.

Peaks Provide Effective Survey Bases

One way of explaining, in simple terms, the reason why the new land lighthouse system has proved so effective in Alaska is to point out that in regions of high mountains, triangulation is possible only where

(Continued on page 128)

Photo shows a group of government surveyors making their way up the dangerous face of an Alaskan peak to establish Canadian boundary lines. A single mis-step on this narrow ledge means a horrible death in the yawning chasms below.

Floating Ambulance Aids Life Guards at California Beach

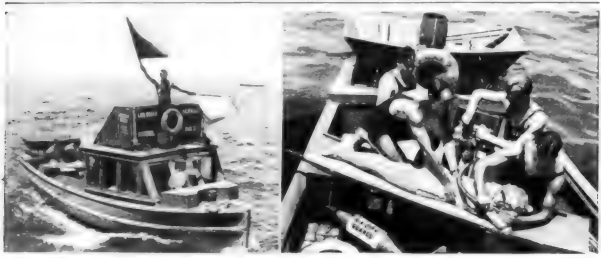


Photo at left shows floating ambulance heading shoreward with victim as guard wigwags from bridge for shore crew to stand by. Right, a closeup of resuscitation work aboard rescue ship as several guards attempt to revive fair bather.

A FLOATING ambulance, built by the Los Angeles playground department, was recently put into commission by the life guard service to protect Los Angeles beaches.

Said to be the first of its kind, the unusual patrol boat is completely equipped with all varieties of lifesaving apparatus. The craft is fitted with inhalators, stretchers and all the hospital equipment necessary to render first aid. The vessel is thirty-three feet long and has a 15-knot speed.

Artist Creates Novel Ship Model

BY MOUNTING the bisected half of a ship model against an oil-painted background of sky and floating it on painted waves carved out of wood, an ex-sea captain has evolved a new art form. The hull is cut from one piece; and the paper-thin sails are carved from solid wood. The ocean is also wood with waves painted upon it. The ship and the ocean are mounted in relief against the background and then framed in glass.

Captain Andrew Axel, retired sailor, is shown with the unusual ship model which he carved and painted in his shop.

Panel Indicates Truck Signals

WITH the aid of a lighted rear panel, English truck drivers have little difficulty in signalling their intentions to motorists behind them.

The panel is equipped with a lighted stop signal and directional arrows indicating right and left turns. The license plate tops the panel.

Photo shows lighted signal panel on rear of English truck.

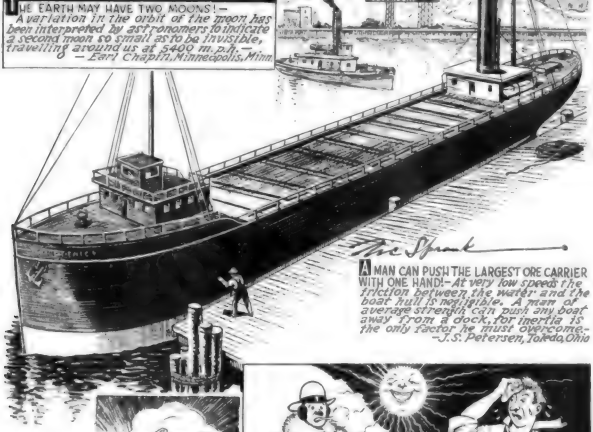
Camera Dissects Lightning Flash

LONG considered the last word in speed, lightning has found its master in a camera. This instrument works so fast it has been able to separate what seems like a single bolt of lightning into ten separate flashes, widely spaced on a film that moves at a rate of a mile a minute and shows what happens in a single second.

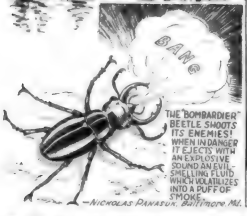
The camera with which the pictures were taken consists of a drum carrying the film at 3000 revolutions a minute. In the axis of the cylinder is the lens; behind it are prisms that reflect an image of the flash in two directions simultaneously, one to each side of the drum, so that a picture is obtained with film movement in two directions. It was discovered that the main stroke of the bolt travels at speeds from 73 to 180 feet per microsecond (millionth of a second).

One Man Can Push Biggest Ore Ship; Nic Sprank in ODDITIES of SCIENCE

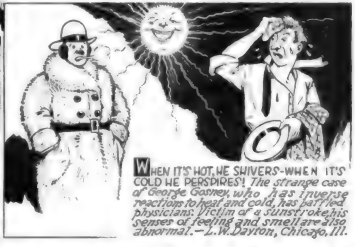
THE EARTH MAY HAVE TWO MOONS!—A variation in the orbit of the moon has been interpreted by astronomers to indicate a second moon so small as to be invisible, travelling around us at 5400 m. p.h. —Earl Chaplin, Minneapolis, Minn.



A MAN CAN PUSH THE LARGEST ORE CARRIER WITH ONE HAND!—At very low speeds the friction between the water and the boat hull is negligible. A man of average strength can push any boat away from a dock, for inertia is the only factor he must overcome.—J. S. Petersen, Toledo, Ohio



THE BOMBARDIER BEETLE SHOOTS ITS ENEMIES! WHEN IN DANGER IT EJECTS WITH AN EXPLOSIVE SOUND AN EVIL-SMELLING FLUID WHICH VOLATILIZES INTO A PUFF OF SMOKE.—Nicholas Pinatur, Baltimore, Md.



WHEN IT'S HOT, HE SHIVERS—WHEN IT'S COLD HE PERSPIRES! The strange case of George Gaines, who has inverse reaction to heat and cold, has baffled physicians. Victim of a sunstroke, his sweater of feeling and smell are also abnormal.—L. W. Dayton, Chicago, Ill.

Win $1! Send your Oddity of Science to Nic Sprank, Modern Mechanix and Inventions, 529 South 7th Street, Minneapolis. No oddity will be considered unless source or proof of item is included. No oddities will be returned.

Uncle Sam's Coastguard—

Flares and rockets are used on the beach to signal messages to surf rescue boats. At left is the first government life saving station at Spermaceti Cove, N. J., erected in 1848. It had one lifeboat.

by
LOWELL AMES NORRIS

"NCU.....NCU.....NCU." Far out at sea, a great ship flying the American flag, drifting helplessly, is wallowing in the trough of mountainous seas. On the towering superstructure lashed by waves and winds of gale force, the radio operator in his tiny shack is sending forth the new distress signal—the call for the United States Coastguard—the signal which in many instances is now supplanting the old traditional SOS.

"NCU".....NCU.....NCU."

He waits a moment before repeating. Into his earphones come welcoming dots and dashes. The U. S. Cutter, *Mojave*, has answered from a few miles outside Boston . . . the *Cayuga* cuts in from the tip of Cape Cod.

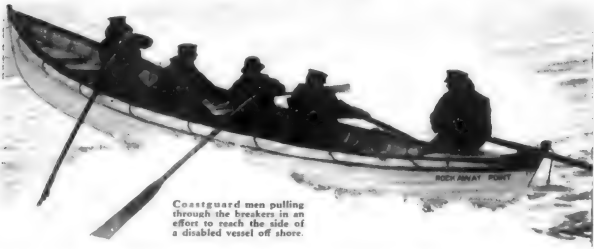
The United States Coastguard, heroes of the seas, are on their way to the rescue.

After nearly 150 years of unbroken humane service backed by superhuman efforts which have resulted in the saving of thousands of human lives and the salvaging of millions of dollars' worth of property, mod-

For years the breeches buoy, shown above, has been the means of saving hundreds of lives. A two-inch brass cannon fires a line over the spars of a stranded ship. The crew then pulls the heavier cable aboard and makes it fast. Another line tows the doughnut preserver with its canvas shorts from shore to ship and one by one passengers and crew ride over and through waves to safety. Efficient powered lifeboats are gradually displacing the breeches buoy in rescue work.

(Photos Courtesy U. S. Coastguard)

Fighting Heroes of the Seas



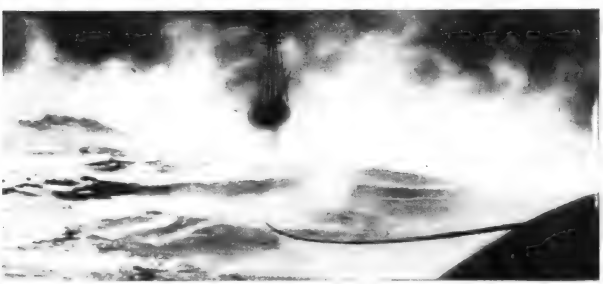
Coastguard men pulling through the breakers in an effort to reach the side of a disabled vessel off shore.

ern science is bringing new aids to these gallant sea fighters.

In the last analysis, the red-blooded manhood and undaunted courage of these men of the coastguard form the final bulwark against disaster, but it is the practical application of modern day scientific knowledge which now permits even more daring rescues.

Since that memorable day back in 1909 when Jack Binns first flashed a frantic CQD for help, radio has played an important part in rescues at sea. At the present time when the coastguard signal NCU has largely displaced the old SOS along American coasts except in cases of exceptional emergency, radio is now playing an even more important role. Now when distress signals are received by patrolling coastguard cutters, they are immediately radioed back to divisional headquarters. Here by means of the direction finder or radio compass, calls are plotted. The position of the disabled ship is determined upon the charts and the exact longitude and latitude is sent almost at once to the waiting cutter and any nearby ships that can go to the rescue.

Modern communications play an important part in life saving. On the New England coast alone there are more than 230 miles of submarine cable and telephone wires, operated and maintained by the coastguard. When commercial telephone service fails in severe weather, coastguard communications must be kept open at all costs. To the credit of this little-known branch of coastguard service these telephone and cable lines have been main-



Saved by a coastguard cutter this disabled schooner is being towed to port in a storm.

At left is the new 36-foot powered lifeboat built at a cost of $13,000. It is self-bailing and non-capsizable. These ships can turn over, right themselves, and bail themselves dry in eleven seconds. Water cannot reach the engine compartment. Equipped with radio, the boat is fitted with all latest life saving paraphernalia.

tained under all conditions for the past fourteen years without a break.

To be sure, there have been crucial moments when cables broke and coastguard trouble men were ordered out for repairs. Those in the service have not forgotten the occasion when the coastguard cable laying ship AB-7 was ordered out in a big blow to make repairs on a submarine cable. Far out in the pitching, tossing waters they located the break and were making repairs when officers in charge discovered something had gone wrong with the ship. Investigation brought forth a serious discovery. A heavy keel had just been added to make the ship seaworthy.

One by one the bolts which held this keel secure were slowly giving way. With the keel gone, the ship would be in danger of capsizing. Frantically the men worked to complete the cable repairs. Successful,

This coastguard plane flew miles out to sea to take this injured man off a steamer and rush him to a hospital ashore for treatment. Airplanes are now used for emergency rescues and for quickly locating distressed ships at sea.

Breeches Buoy Still Is Used to Rescue Crews From Stranded Vessels

Above—Crew of a coastguard station practising breeches buoy drill. Hour after hour is spent practising with the muzzle loading 2-inch brass cannon in shooting the line over the spar in the background. The breeches buoy is used to effect rescues from ships being pounded to pieces on rocks close to the shore when rough seas prevent the launching of lifeboats.

At left—a steamer aground off the coast of Washington. Note the huge waves striking the sides of the vessel. In a short time the ship was pounded to pieces on the rocks. The crew was saved by the daring coastguard who braved the storm-tossed seas. In one year the coastguard saved 6,492 lives. In addition 33,716 persons aboard ships received assistance from men of coast service.

The crew of this auxiliary schooner was rescued by means of the breeches buoy. The vessel sank off Massachusetts.

the wallowing boat put about for shore. The ship became almost unmanageable. The keel slipped lower and lower. By the time the ship reached port, the keel was only hanging by two last sustaining bolts. But emergency repair work had been completed and coastguard communications were maintained.

At the present time the radio teletype is fast emerging from an experimental stage to take its place with other established communication systems. The teletype is a machine not unlike a typewriter which can send and receive typewritten messages either over a telephone wire or by radio. The radio teletype was perfected by an unknown radio operator in coastguard circles after navy experts gave it up as impractical.

Changes in the Coastguard Service

For many decades there has been little change in the equipment used by the life-saving land forces of the coastguard service. Colored signal rockets have been largely displaced by electric light blinkers that flash messages from beach and signal watch towers. In every land station there is a staunch beach cart compactly packed with life-saving equipment including the breeches-buoy, lines, lanterns, signals, shovels, axes and other essentials ready to be hauled forth in time of need. But the old friendly horse which used to perform this service is no more. He has been replaced by either tractor or truck. And the wide iron tires of these beach carts are fast being replaced by rubber pneumatic tires.

The breeches buoy, the doughnut life-preserver with dangling canvas shorts that brings mariners over a temporary rope cable from ship to shore, is seldom used in these modern times. Yet hour upon hour is still spent practising with the old fashioned muzzle-loading 2-inch brass cannon in shooting the line over a target spar an-

(Continued on page 130)

Craftsman Builds Model of Liner He Has Never Seen

Photo shows the eight-foot model of the Italian liner, "Rex," constructed from postcard views by Brooklyn man.

A NEW record for home craftsmen to shoot at was recently established by Antonio Romano, of Brooklyn, New York, who has just completed an amazingly faithful model of an ocean liner that he has never seen.

Romano's subject was the famous Italian liner, *Rex*. Undaunted by the fact that he had never actually seen the vessel, he secured a number of picture postcards and from them obtained the necessary construction details.

The finished model is eight feet in length and is painstakingly complete in every detail, from keel to rigging. All equipment carried by its giant counterpart is duplicated in the model which was built entirely by hand in Romano's workshop.

Huge Bulb Holds Kneeling Girl

BUILT as a laboratory exhibit, a mammoth lamp bulb, weighing 50 pounds and standing 56 inches high, is large enough to accommodate a kneeling girl.

When exhausted, to create a vacuum within, the quarter-inch walls must withstand a crushing strain of 40,000 pounds, and a tremendous temperature generated by incandescent tungsten wire thicker than a fountain pen.

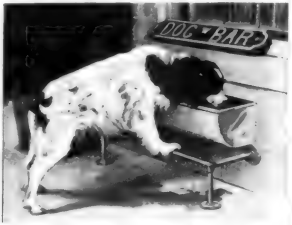
The filament of this giant lamp would operate at perhaps half the temperature of the sun's atmosphere, equivalent to an energy of 135 horsepower. To conserve this heat the bulb is filled with 200 quarts of a rather rare gas called argon.

Kneeling girl inside bulb is holding a standard 60-watt lamp. Right, the huge glass cup used to form lamp's base.

Novel "Bar" Tempts Thirsty Dogs

DROUTH and hot weather hold no terrors for the canine residents of Atlantic City, New Jersey, who have their own private drinking establishment, provided by a lover of dogs.

The "dog bar," as it is called, is situated outside the offices of a sympathetic veterinarian, Dr. A. E. Stockton, who has provided his four-footed friends with a drinking trough which even boasts a brass rail and a blue eagle. Summer hot spells brought a steady stream of grateful patrons to the doctor's canine "bar."



A boon to thirsty dogs is this "dog bar," installed by an Atlantic City veterinarian outside his office quarters.

Colored Lights Repel Insects

DISCOMFORT caused by mosquitoes, moths and other flying bugs attracted to lighted, open porches is expected to be a thing of the past, following recent scientific experiments. The investigators discovered that white lights attract bugs, whereas colored lights repel them. Use of such lighting is recommended for street lights, gardens, pavilions, country clubs and all outdoor gathering places.

Germans Devise Motorless Boat Driven by Screw Prop

GERMAN engineers have recently developed a device which drives a motorless craft through the water by means of a screw propeller.

The motive power necessary to turn the screw is derived from a propulsion hand lever connected via a drive shaft and gear system to the propeller.

Propeller revolutions may be stepped up by means of a gear shift lever. The rudder is controlled by foot pedals connected with the tiller.

The design of the mechanism is such that the operator may propel the boat while seated facing the direction of travel, as contrasted with conventional styles of rowing.

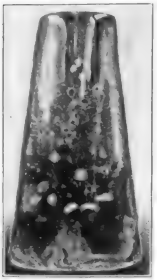
It is said that the new device enables the rower to propel the boat through the water with the speed of a small motor boat with little or no physical exertion.

The contrivance may be fitted into almost any type of small boat. The mechanism is simple and may be operated by anyone.

Photo at right shows rowing mechanism which connects through drive shaft and gear system with screw propeller. Note rower may face forward in operating device, as opposed to conventional style.

Operating mechanism of motorless boat is shown below. Note high speed gear shift.

Ship Flowers in Blocks of Ice



Packed in moulds, then frozen, flowers keep original freshness.

THANKS to a new method of preservation, flowers shipped from Australia to London survive the long trip and arrive in perfect condition.

The flowers are first placed in a mould which is then frozen, completely enclosing the blooms in a block of ice. Although often weeks old, the flowers retain their original beauty.

Low Temperature Record Is Set

REACHING a temperature of 459.6 degrees below zero, Fahrenheit, Leyden scientists approached absolute zero in recent experiments. The temperature reached was 0.03 of one degree Kelvin above absolute zero and is believed to be the lowest recording ever attained. The figure was secured with a special apparatus.

Japanese Water Skis Are Speedy

COMMONLY associated with northern climes, skiing has invaded the Orient with the successful introduction of water skis. The skis are tip-tilted pontoons propelled by the common gliding stroke and aided by special ski poles. Recent tests of the skis in Yokohama harbor developed a speed of 200 yards per minute.

Demonstrating his water skis in Yokohama harbor, a Japanese soldier attained a speed of 200 yards per minute.

Endless Chain Conveyor Moves Cars Thru Auto Laundry

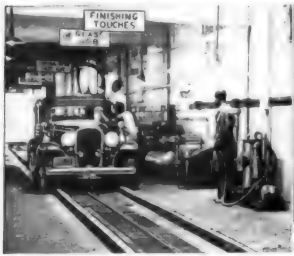


Photo at left shows car on endless conveyor chain moving through auto laundry. Right, the novel brush arrangement which is lowered from ceiling to wash the top of the car.

BORROWING an idea from the assembly lines of large automobile factories, an inventive garage man has devised an endless chain conveyor system which moves cars through his auto laundry to permit a complete cleaning and polishing job in nine minutes.

The patron merely drives his car onto a guide track and steps out. A coupling chain is then attached to the front bumper and the main chain running along the floor. A button is pressed and the car begins to move. As it passes each section of the track, streams of water play on wheels and body. A revolving brush drops from a hinged support in the ceiling and cleans the top of the car as jets of water pour from the brush.

Powerful blowers then dry the car and a giant vacuum system removes the grit and dirt from both the inside and outside of the car.

Electric Clock Times Phone Calls

WITH stop-watch precision a new electric desk clock times long distance telephone calls on an illuminated dial.

When connections are completed, the caller presses a button which causes a red light to flash in the bull's-eye above the figure 12. Each fifteen seconds thereafter lights flash in succession around the dial. Special lights warn the speaker when the final 15-second and 2-second periods are reached.

Colored lights flash in succession around the face of this electric clock to warn speaker of elapsed time in making a long distance call. A special motor operates both clock mechanism and the lighting system.

Cigar Has Absorbent Filter Tip

Closeup of individual holder which has absorbent filter tip.

TO INSURE positive cleanliness, plus a cooling smoke, cigars are now fitted with individual tips, or holders, of molded bakelite.

Each tip is equipped with an absorbent filter which is said to eliminate all harshness or bite. The new tip permits the cigars to be smoked down to last half inch.

Aztec Ruler Was First Aviator

LONG before King Solomon's time, an Aztec ruler glided from the Mexican mountains down into the valleys according to recent discoveries by a Polish archaeologist. In addition, this Aztec Lindbergh founded an aviation school.

The scientist has found stone engravings supporting his theory, picturing a glider and aviation goggles not unlike those worn by fliers today.

ELECTRIC EYE to Guide CREWLESS Train

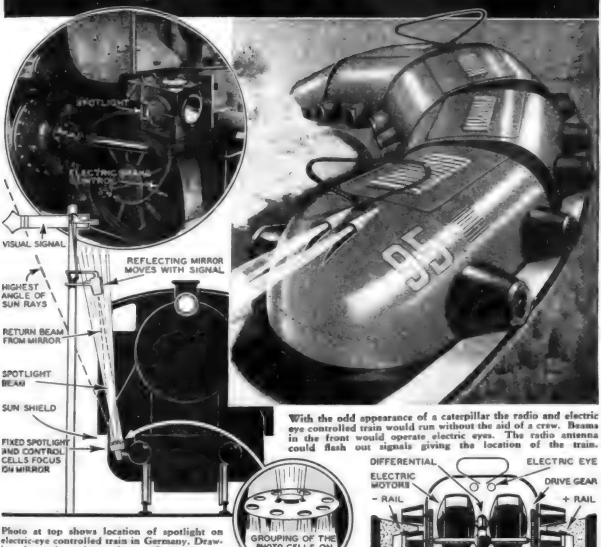


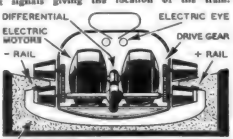
Photo at top shows location of spotlight on electric-eye controlled train in Germany. Drawing above shows how mirror reflects beam to cells around spotlight. The cells are set at an angle so that they will not be hit by sun rays.

With the odd appearance of a caterpillar the radio and electric eye-controlled train would run without the aid of a crew. Beams in the front would operate electric eyes. The radio antenna could flash out signals giving the location of the train.

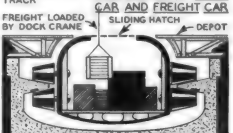
USE of electric eyes to control trains in Germany may lead to the development of railroad trains requiring no crews. The suggested design calls for a freight train of caterpillar-like series of low, wide trucks with an electric power unit in the lead car. It would operate on special tracks of wedge shape concrete. Imbedded in these are the electric rails which supply current for the motors.

Electric eye beams in the lead car would be used to control the train under normal conditions. These photo-electric signals could slow down the trains at curves and stop them at proper stations.

An experimental electric eye railroad signal is now in use on the Reichsbahnzentralamt of Munich, Germany. It consists of a spotlight mounted on the locomotive that throws a beam upward to a reflecting mirror on the block signal. When the signal is set to stop the train, the mirror reflects the beam to selium cells which automatically set the brakes.

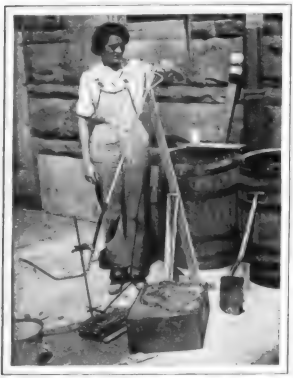


CROSS SECTION OF DRIVE CAR AND FREIGHT CAR



Above at right is a cross section of the power unit of the crewless freight train. The two sets of convex wheels riding above and below the concrete track would eliminate danger of train leaving tracks at high speed. The cars could run into a flush station platform as shown at right for easy loading and unloading.

Science Students Find Gold Near Philadelphia City Hall



Substituting overalls for chiffons, a feminine mineralogy student demonstrates how a liquid clay solution is forced thru mercury tube apparatus in gold-separation experiment.

PROSPECTORS who insist upon equipping a pack train and traveling far afield in search of precious metal may draw a moral from the recent discovery of gold virtually within the shadow of Philadelphia's City Hall.

The find was made by mineralogy students of the Philadelphia Academy of Natural Science in connection with their class work.

Seeking a clay solution for use in experimental work involving gold separation, they secured a quantity of earth from an excavation project a short distance from the City Hall. The clay was reduced to a liquid state and introduced by means of a funnel into a mercury tube which separates gold from other foreign matter.

From a scientific standpoint, the experiment was a success. The commercial results, however, were hardly sufficient to inspire a new gold rush, since it was found necessary to treat a cubic foot of clay to obtain enough of the metal to buy a 3-cent postage stamp. Gold obtained by the mercury tube miners will be placed on exhibit in the Academy.

Mechanic Builds Home-made Sub

SAILBOATS and outboard-powered craft may serve for most amateur sailors, but Byron Connett, of Chicago, Ill., turns to a home-made submarine for his sea-going thrills.

Built in Connett's shop, the one-man submersible was recently given an exhaustive but successful test by its inventor.

Only twenty inches wide and thirty-four inches high, the craft is just large enough to accommodate Connett. The vessel weighs less than a thousand pounds and has remained submerged for more than an hour.

Connett's ship has an air regulator and an automatic pump and is powered by an 8-volt motor from storage batteries.

Byron Connett, Chicago inventor, is shown with the home-made submarine which has remained under water for more than an hour. The novel craft has an air regulator and automatic pump and is powered by a storage battery motor.

Truck Is Tripod for Huge Camera

Used for photographing electric signs at long range, this giant camera uses 28x34 special plates, and is equipped with a lens boasting a focal length of 52 inches.

NEED for a special camera to photograph huge electric signs mounted on tops of buildings resulted in the recent development by technicians of a photographic "Big Bertha" which uses a motor truck for its tripod.

Designed especially for advertising work, the giant camera has a lens with a focal length of fifty-two inches and uses special plates measuring 28x34 inches.

By means of this huge machine a photographer may obtain a comparatively large image, free from distortion, even at considerable distance from the subject.

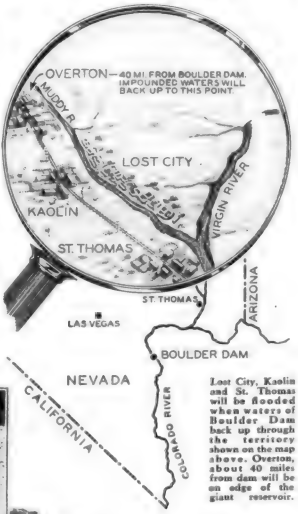
Waters of Boulder Dam to DESTROY AMERICA'S FIRST GREAT CITY

WHEN the waters of the Colorado river back up behind the massive wall of Boulder Dam, America's first large city will disappear forever.

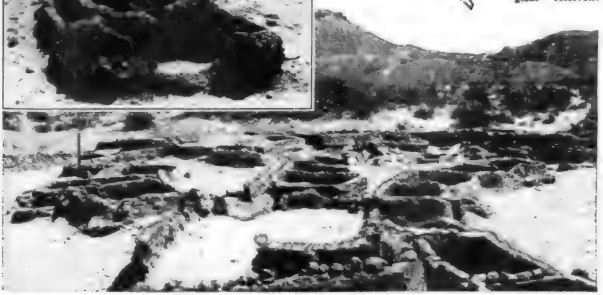
Once inhabited by Pueblo Indians, fifteen centuries ago, the ruins of the Lost City today sprawl for five miles along the Muddy river, in southern Nevada, about 40 miles, airline, from Boulder Dam. Under the guidance of Mark Raymond Harrington, archaeologist for the Los Angeles Southwest Museum, CCC workers have unearthed countless relics and ruins of dwellings which open new pages in American history.

Excavations reveal that these early Americans built long rambling structures containing as many as 95 rooms. They constructed countless household implements, mined salt, devised a crude air conditioning system and watered their land by irrigation.

Boulder Dam's impounded waters, however, will flood the Lost City, leaving only a museum at Overton, on the edge of the reservoir, as a reminder of the nation's first metropolis.

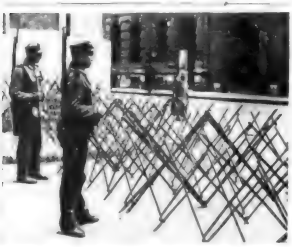


Lost City, Kaolin and St. Thomas will be flooded when waters of Boulder Dam back up through the territory shown on the map above. Overton, about 40 miles from dam will be on edge of the giant reservoir.



Top photo shows Mark Harrington examining 15-century old dwelling. Note double wall cooling system for hot weather. Lower photo—A closeup of the ruins of a huge Lost City community residence which contained 95 rooms.

"Patent" Entanglements Barricade Streets in Vienna Riots



Nazi uprisings in Vienna caused the streets to be barricaded in the manner shown above. These sharp-tipped barriers have proven far more effective than ordinary barbwire.

FOLLOWING the recent Nazi uprising which culminated in the assassination of Chancellor Dollfuss, "patent" entanglements were hastily erected by military authorities to barricade the streets of Vienna.

Singularly successful in helping to quell the Socialist riots last February, the entanglements are far more formidable than ordinary barbed wire. They consist of a number of sharp-tipped metal rods, crisscrossed much like a number of stacked bayonets. Wire cutters are unavailing against the sturdy metal which provides an effective barrier to both vehicular and pedestrian traffic.

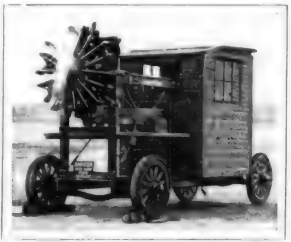
Wind-Electric Plant Perfected

MOUNTING a 98-foot wheel atop a steel tower 82 feet high, Soviet engineers have successfully operated a 100-kilowatt wind-electric plant in the Crimean sector for more than a year.

The windwheel has self-regulating, variable-pitch blades which are automatically operated by centrifugal force. The entire machine rotates on a spherical pivot in the top of the tower. The device is kept into the wind by a small motor actuated by a weather vane.

This 100-kilowatt wind-electric plant has been in successful operation for more than a year by Soviet engineers. The machine operates on a spherical pivot in the top of the 82-foot tower and is kept pointing into the wind by a small motor which is actuated by a weather vane.

Wheeled Building Travels 70 mph



This movable testing stand for airplane engines, developed at Roosevelt Flying Field, will travel seventy miles an hour.

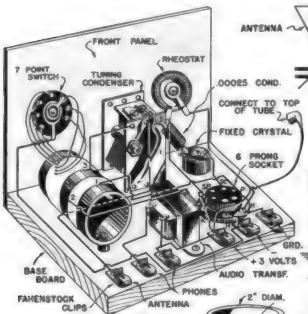
A WHEELED building which travels 70 miles an hour is the result of experiments at Roosevelt Field, Long Island, to develop a testing plant for airplane engines.

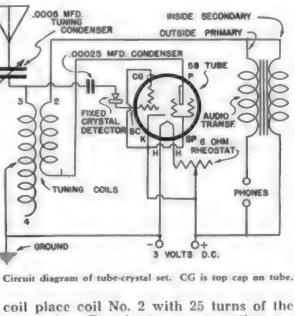
A shack-like structure and an engine testing stand were mounted on a chassis which can be propelled under its own power at better than mile-a-minute speed. The advantage of the novel device lies in the fact that engine tests may be conducted at any part of the field, owing to the mobility of the testing stand.

Machine Magnifies 10,000 Times

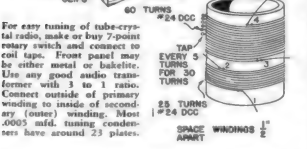
USING electrons instead of light rays to "see" tiny objects, a German scientist has developed a machine which, by magnification in two stages, enlarges objects about 10,000 times. Maximum enlargement usually possible with optical instruments is 3,500 times. Glass lenses cannot be used in the electron microscope. Electric or magnetic fields take their place, bending the electron streams as lenses bend or focus light rays.

All Wave Tube-Crystal Radio Set Needs No "B" Batteries





Circuit diagram of tube-crystal set. CG is top cap on tube.



For easy tuning of tube-crystal radio, make or buy 7-point rotary switch and connect to coil taps. Front panel may be either metal or bakelite. Use any good audio transformer with 3 to 1 ratio. Connect outside of primary winding to inside of secondary (outer) winding. Most .0005 mfd. tuning condensers have around 23 plates.

THOUGH purely an experimental set using extremely low power, this combination crystal and tube receiver will work very nicely with only two flashlight cells. It is ideal for camping trips, for lake cottages and for mounting on bicycles or in cars.

The tube is a type –58 using a six-prong socket. The fixed type crystal detector can be purchased from radio supply houses for about fifty cents.

The tuning coil is wound on a 2" or 2½" diameter form. Place about 60 turns of No. 24 double cotton covered wire, wound close, on the coil, tapping off every five turns for 30 turns. One-half inch from this coil place coil No. 2 with 25 turns of the same wire. For short wave reception use 20 turns on coil No. 2.

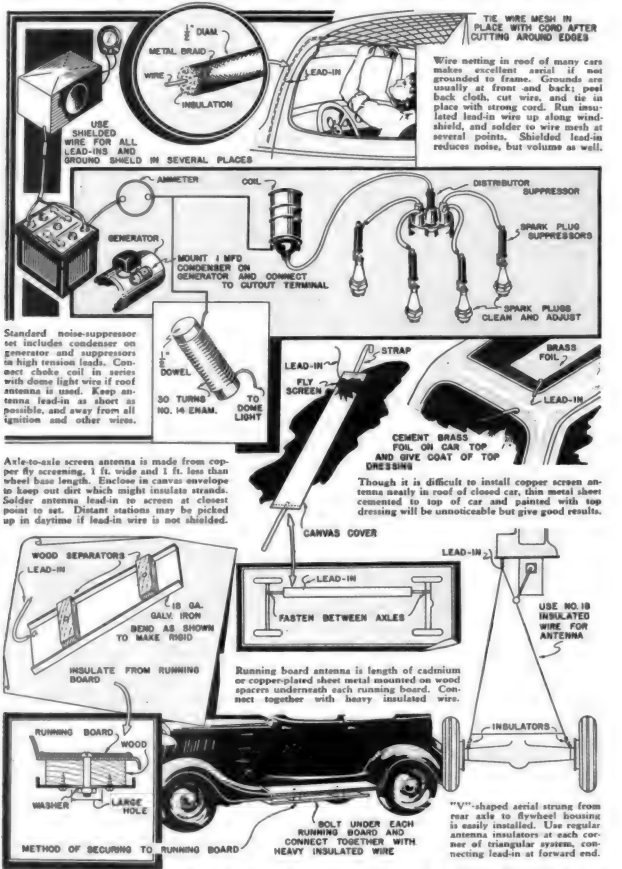
In tuning, adjust the filament rheostat to place 2 volts or less on the tube. Set the tuning coil on the tap which gives the least number of turns, and slowly turn the tuning condenser. With sensitive headphones the volume will be especially good. A slight tapping of the crystal may be necessary at times to reset it.

Heat Glass to Pep Up Radio Tubes

THE new radio tubes with oxide coated filaments can be rejuvenated by slowly heating the glass with a blow torch or alcohol lamp until all of the silvery deposit inside the glass has disappeared. Test for shorts after cooling.

Avoid heating glass excessively when rejuvenating oxide-coated filament tubes by external heat.

Noise-Reducing Kinks for the Auto Radio



Suppression of ignition noises while engine is operating is biggest problem of auto radio installation. Standard suppressor kits are satisfactory for most cars, and are easily installed. Where noise still persists, above kinks should clear up trouble.

Make Phonograph Records WITH YOUR RADIO SET

by THOMAS A. BLANCHARD

IT IS not at all difficult to make your own phonograph records; the quality of the finished record is surprisingly good when played back through the loudspeaker of your radio set. You can make recordings of your voice, of musical programs put on by friends, or even of favorite radio programs.

The equipment needed, besides your broadcast receiver, is a good phonograph pickup unit and either an electric or motor-driven turntable.

Pre-grooved records, either aluminum or bakelite, simplify the recording apparatus. A special needle is required for aluminum records, but ordinary needles are used for both recording and playing on bakelite. The bakelite records will be found most economical for home use.

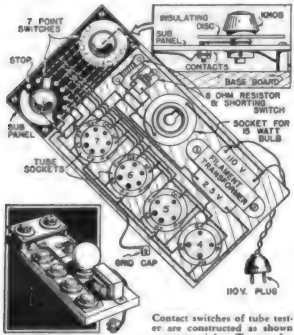
With a radio having a magnetic speaker, the connections are easy. For recording, remove the speaker leads and connect in their place the phonograph pick-up leads.

If you are recording speech or music, connect your single button microphone and a 4½-volt "C" battery in series with the primary of an input transformer, the secondary of which is plugged into the phonograph pickup terminals of the radio set. On

(Continued on page 120)

Connect apparatus as above when playing back records on magnetic speaker set. Better results are obtained in some cases by connecting pickup first to 4000 ohm output transformer with transformer primary connected to output stage of set.

Testing Set Locates Shorts, Open Filaments in All Tubes

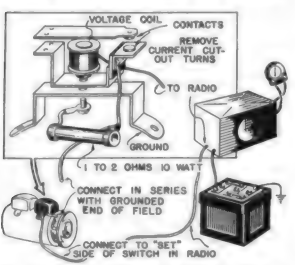


Contact switches of tube tester are constructed as shown at upper right. To test for shorts, spin dial of one as other dial is set on each contact in turn; bulb should light for only one setting in each case.

Car Radio Draws Little Current

WITH this device connected to the car radio, when the car is in motion the charging rate of the generator is automatically raised 5 amperes when the set is turned on, and lowered as the load is cut off.

An old generator cut-out is connected from the set side of the radio switch to ground. When the radio is turned on, current flows through the coil, pulling down the armature and closing the contact points. A resistance placed in series with the grounded field lead is thereby shorted out and the generator charging rate increased.



One end of cut-out coil is already grounded to frame. 2 ohm radio resistor connected from insulated contact to ground will drop charging rate 5 amp. on most generators.

WHILE this radio tube testing device cannot give the exact operating characteristics of tubes being tested, it does tell whether it is safe to place them in the radio set, and whether the filaments are shorted or burned out.

The tester is shown in its most complicated form, made to accommodate all types of tubes. If only 4 and 5 prong tubes are to be tested, the layout can be simplified considerably.

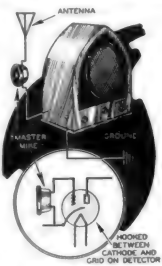
The 2½-volt filament transformer will make the filaments of even 5 and 6.3 volt tubes glow. The shorting switch should be opened to place the 8 ohm resistor in series with the filament for the 2-volt tubes. It is closed for all other tubes.

The dial switches check all possible combinations of electrodes to locate any which are touching.

Connect Condenser Mike to Radio

WITH the highly sensitive new radio sets, a condenser microphone for public address work will often work satisfactorily in series with the antenna.

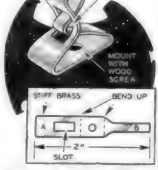
On electric sets this type of microphone can be hooked between the cathode and the grid of the detector tube. Attach to the 2nd detector tube on superhet receivers.



How "Master Mike" condenser microphone described in March, 1934, issue is connected to radio.

Making Spring Type Binding Posts

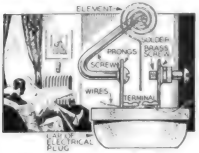
ANY springy, stiff metal can be made up into spring type terminal posts for radio work. Cut out strips as shown at right, making the narrowed end small enough to fit through the slot. Punch out the slot with a cold chisel. A dozen clips can be made up in a short time.



Terminal posts made by cutting out spring brass with tin snips and chisel, then bending.

Temporary Fuses Made From Electric Plugs and Foil

A PENNY slipped under the last fuse in the house is often forgotten, and may result in a short circuit starting a serious fire. Take an ordinary electric socket plug and insert in each slot, ends downward, ordinary wire paper clips. Now cut 1/16" wide strips from almost any kind of tinfoil, and slip a short length in place between the paper clips. When this improvised fuse blows, just insert another strip of foil. If it blows too often, increase the width of your foil strip. This fuse mounting will be found ideal for your workbench test panel.—H. M. Anderson.

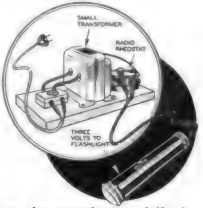


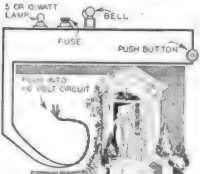
Heat Control Thermostat Uses Bimetallic Element

THE dial type oven thermometers sold in dime stores contain a bimetallic element suitable for use in a thermostat. A bakelite electrical plug provides a well insulated mounting base, the terminal screws being used for attaching leads to the furnace damper motor. The contact screw is adjusted to open the circuit as proper room temperature is reached.—V. J. Andrew.

Connecting Flashlight to Lighting Circuit

IN FACTORY inspection work, in auto repair jobs, and even in home radio repair jobs it is often necessary to use a flashlight continually. By operating the flashlight from a small bell ringing transformer, using a radio rheostat to adjust the voltage to the proper value, the problem of battery expense can be solved. Connect the radio rheostat and the flashlight bulb in series with the transformer secondary. Solder leads to the flashlight case and to the central bulb contact.—S. G. Benton.



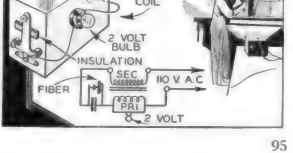


Operating Doorbell Without Transformer

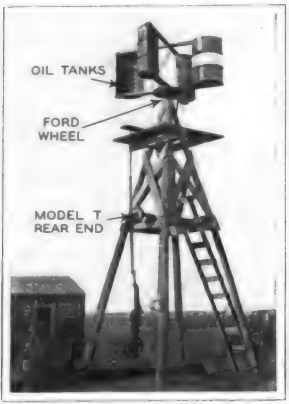
WHEN doorbell batteries or the transformer fail, the bell can be operated directly from the 110-volt power lines by using the circuit at the left. A bayonet plug and extension cord are connected to the old battery leads, and two light sockets placed in series with the door bell. In one socket place a 10-watt bulb, in the other a 10-ampere fuse. If the bell will not operate, try a higher wattage bulb. Some bells will operate satisfactorily with only a 5-watt bulb.—L. B. Robbins.

Ford Coil Operates Night Light

A MODEL T Ford spark coil, if properly connected, makes a useful step-down transformer with enough power for a night light. The power drawn is so small as to defy measurement on the house meter. After soldering the connections as indicated in the sketch, insert a strip of fibre or cardboard between the contact points. Tighten the vibrator thumb nut to prevent humming and to hold the insulating strip in place. The bulb can be mounted at any desired position by using long leads.—Chas. D. Savage.



Wind-Driven Whirling Oil Barrels Pump Water for Farms



Novel whirling drum windmill on farm of Bjorn Haugen, Dunn County, North Dakota, pumps water for livestock.

WITH water holes drying up, farmers in North Dakota found it necessary to pump water for their livestock from deep wells. Bjorn Haugen, of Dunn County, utilized abandoned auto parts and a few telephone poles to make this unusual yet efficient windmill for his farm.

Two 55-gallon steel oil barrels cut in half are mounted on a wood framework which in turn is attached to a model T Ford wheel. A Ford rear end is mounted just beneath and a shaft extended upward to the auto wheel.

A pitman on the wood pulley attached to the drive shaft lifts the pump rod up and down as the windmill operates. Springs help overcome gravity on the upward stroke of the pump. The total height of the structure is thirty feet.

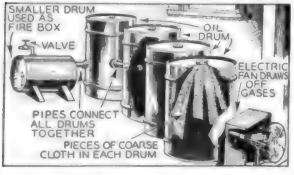
This windmill, with its roller bearing mounting, will operate in very little wind, furnishing enough water for all farm requirements.

Making a Lamp-black "Factory"

A FEW old oil drums, an electric motor, and some odds and ends of metal can be made into a small lamp-black "factory" which will produce a nice income. Local paint and hardware stores will purchase your product at a good price.

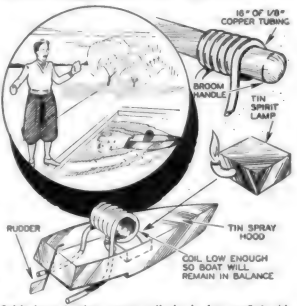
Used auto engine oil is burned in a 10 gallon can to produce the heavy, black smoke made to fall as soot in the settling chambers. A valve controls the amount of air admitted to the firebox.

Four 35-gallon oil drums are connected together and to the fire box with air-tight lengths of pipe. Air-tight doors in the bottom of each tank permit removal of the soot.



Entire soot "factory" system must be air-tight. Rags in drum aid settling of fine carbon particles in heavy, black smoke.

Heat Engine Powers Mystery Boat



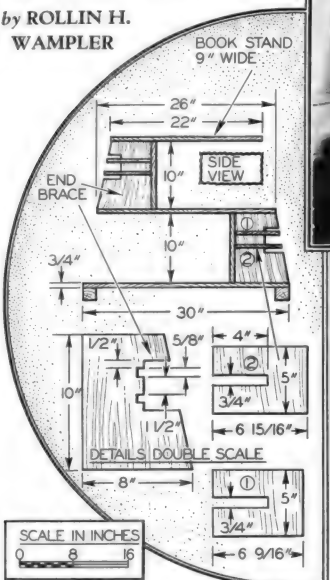
Spirit lamp heating copper coils is tin box stuffed with cotton soaked in alcohol, with jet soldered into one side. Heat engine can be mounted in any small model boat.

MOVING silently and smoothly through the water with no visible source of power, no motor, no springs, this mystery boat will arouse comment wherever it is shown.

There is a coil of copper tubing on the boat, with both ends of the tube extending behind under water. A small spirit lamp heats the coil, expelling most of the air; cool water enters the tube, is changed into steam by the heat, and by expansion is forced out through the jets to propel the boat ahead.

BOOK STAND *is* MODERNISTIC

by **ROLLIN H. WAMPLER**



Scale drawings show side view of modernistic book stand, together with double scale details of end brace and two decorative shelves. Three main shelves are each 9" wide.

Photo of completed book stand, showing one possible arrangement of books. All edges are finished in jet black enamel to contrast strikingly with gleaming aluminum shelves and back boards.

DECIDEDLY modernistic in design is this neat little book stand. It can be used as an arm chair stand to hold favorite books and magazines, or can be set next to a wall. Having the unique property of harmonizing with almost any type of furniture or color scheme makes it ideal for the study or den.

Almost any of the common woods can be selected for this stand. The finish completely hides the wood, making the appearance of the grain unimportant.

Assemble all pieces with long screws to obtain rigidity. The screw heads should all be well sunk into the wood, and the holes filled with wood filler. When the filler has dried, sand smooth so it is flush with the rest of the surface.

The two decorative shelves at each end require only to be fastened to the vertical support, since the notches in the end braces hold them rigid at one end.

The proper finishing of the book stand is important. It is best to remove the decorative shelves and finish them separate from the rest of the stand. Drive two nails into each of the cleats at the bottom, leaving about one inch protruding, to serve as temporary legs which keep the stand off the floor while it is being finished.

First prime all over with a coat of good spar varnish. After this is dry mix two ounces of a good quality aluminum powder with one-half pint of spar varnish. Thin with a little turpentine if necessary. After sanding the priming coat lightly with very fine sandpaper, apply two coats of the aluminum paint all over, allowing twenty-four hours between coats.

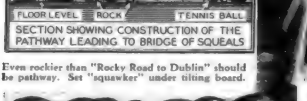
Next apply a coat of very pale floor or spar varnish over the aluminum paint, to prevent the powder from rubbing off onto the books.

Finally, stripe all edges with four-hour black varnish enamel. This produces a beautiful, durable finish that is in harmony with the modernistic design.

THRILLS *and* CHILLS *for*

FLYING PHANTOM—It sweeps through the air like a spectre, its white robes trailing, green eyes mysteriously lighted by a ghoulish gleam. Make lantern from apple-box boards, lay out 1" squares, and trace in skeleton head. Glue green tissue over inside of openings. Bore hole for head of small flashlight. Cover with white cloth, tacking around face and padding at top and sides to fill out head, and tie on trailing white shrouds.

"BOOM" CAN—With resounding explosion heard for blocks, lid of ashcan will sail high into air amid startling flash of golden light when switch is pressed from ambush. Place little water and carbide crystal size of egg in can after mounting ignition apparatus as shown.



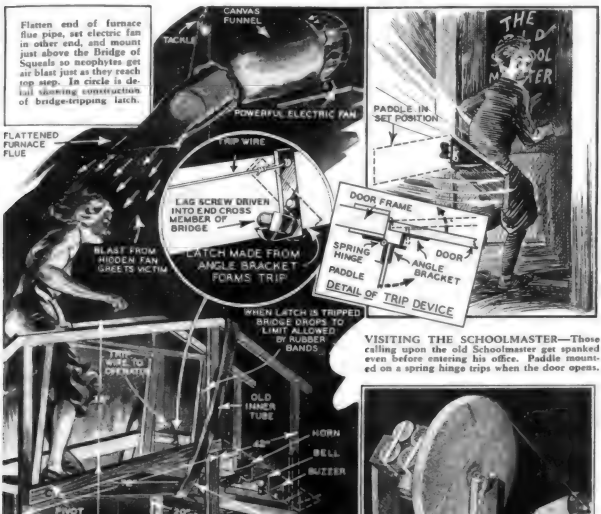
Even rockier than "Rocky Road to Dublin" should be pathway. Set "squawker" under tilting board.

Up the squawking, springing, barking steps of Charon must go the neophyte to reach the Bridge of Squeals. To give encouragement on perilous journey, first step is solid. Others tilt in all directions, in most exasperating manner. Barking cushions are made by attaching balloon razzers to rubber balls. Use sturdy rails on the sides to prevent accidents.

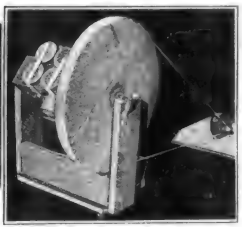
CROSSING THE RIVER STYX

Your HALLOWE'EN *Party*

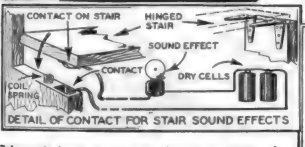
Flatten end of furnace flue pipe, set electric fan in other end, and mount just above the Bridge of Squeals so neophytes get air blast just as they reach top step. In circle is detail showing construction of bridge-tripping latch.



VISITING THE SCHOOLMASTER—Those calling upon the old Schoolmaster get spanked even before entering his office. Paddle mounted on a spring hinge trips when the door opens.



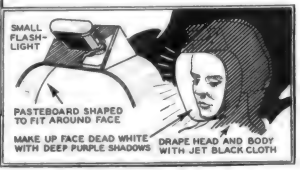
WELCOMING "MOO"—Here's voice mechanism used by E. C. Segar, author-artist of Popeye, at Hallowe'en party. Cowcalls are tied to wheel driven by small motor.



DETAIL OF CONTACT FOR STAIR SOUND EFFECTS

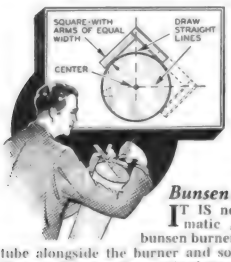
Release trip lever as neophyte is almost across Bridge of Squeals. Water effect under bridge is obtained by directing reflections from illuminated pan of water onto strips of black oil-cloth laid on floor. If floor is concrete, cover with inch of inky-black water, and form waves with fan.

ON THE BRIDGE OF SQUEALS



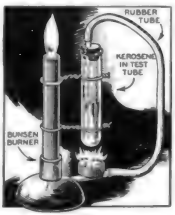
FLOATING FACE OF DEATH—Startling, ghastly effect is achieved by making pasteboard shadow box with flashlight mounted to direct light only on face. Eyes are moved slowly.

WORKSHOP TOOL KINKS



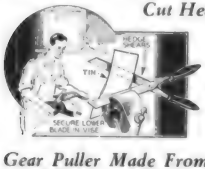
Centering Round Stock for Wood Turning

WHEN stock which is already round is to be set in a lathe for further turning, it is a bit difficult to find the exact center by ordinary methods. If a square with arms of equal width is available, the job can be done quickly and easily. Holding the square near the top of the cylinder, draw a line through inside and outside corners of the square, inward through the center of the cylinder. Shift the square and repeat; the intersection of the two lines will then mark the exact center.—T. H. Littler.



Bunsen Burner Uses Kerosene

IT IS not hard to make an automatic gas supply unit for your bunsen burner. By mounting a pyrex test tube alongside the burner and soldering a small can lid to the gas inlet pipe, the required gas can be generated as needed. Fill the test tube with kerosene, insert a rubber cork having a single glass tube, and run a length of rubber tubing from the top of the test tube to the burner gas inlet. Pour some kerosene over cotton or wool in the can lid and ignite. The boiling kerosene gives off a gas which is ideal for bunsen burner work.—Fred J. Bevan.

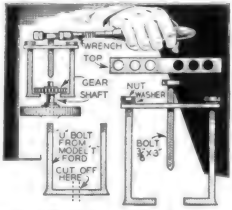


Cut Heavy Sheet Metal With Hedge Trimming Shears

THE heavier grades of sheet metal used for fan blades, metal cabinets, and even metal radio panels can be cut with ease in perfectly straight lines with a pair of ordinary hedge-trimming shears. Fasten one blade firmly in the jaws of a heavy bench vise. Operate other handle of shears with right hand, and support and guide metal with left hand. Curves are cut as easily as straight lines. —H. M. Anderson.

Gear Puller Made From Old Auto Parts

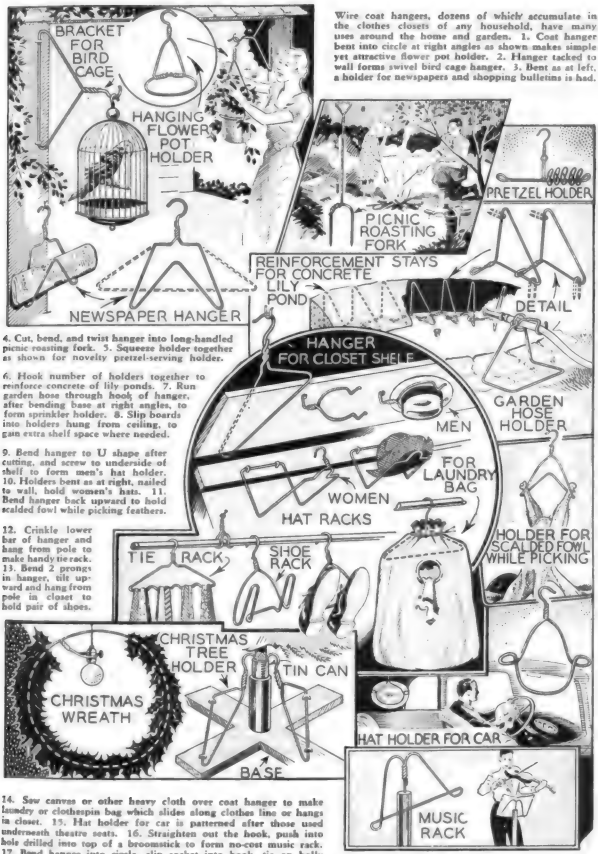
THOUGH intended primarily for temporary work, this device has proved capable of handling even the heaviest of gear and wheel-pulling jobs. An old U bolt such as is used to hold the front spring in position, is cut into two pieces, leaving ¾" of the top section on each piece. Now take a 5" length of ¼" x ¾" steel stock, and drill and tap a hole in its exact center for the ¾" by 3" long bolt. Drill other holes at equal distances from this center one, to permit adjustment of puller for various sizes of gears. Wrench may be used on center bolt.—John Debevc.



Handy Punch Set From Scrap Pipe Lengths

AT LITTLE or no cost a complete set of punches for cutting holes in gaskets or making fiber washers can be had by any workshop fan. Secure as many different sizes of iron pipe or steel tubing as possible, cutting all to a convenient length of about six inches. Now carefully bevel one end of each to a sharp edge, using a power emery wheel for the rough work, and an oil stone for the final sharpening. If gasket cutting is done on a wood block, there is no danger of damaging cutter once it passes through material.—C. A. Gifson.

18 *Practical Uses for Extra Coat Hangers*



Wire coat hangers, dozens of which accumulate in the clothes closets of any household, have many uses around the home and garden. 1. Coat hanger bent into circle at right angles as shown makes simple yet attractive flower pot holder. 2. Hanger tacked to wall forms swivel bird cage hanger. 3. Bent as at left, a holder for newspapers and shopping bulletins is had.

4. Cut, bend, and twist hanger into long-handled picnic roasting fork. 5. Squeeze holder together as shown for novelty pretzel-serving holder.

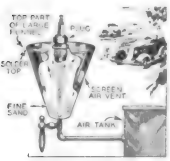
6. Hook number of holders together to reinforce concrete of lily ponds. 7. Run garden hose through hook of hanger, after bending base at right angles, to form sprinkler holder. 8. Slip boards into holders hung from ceiling, to gain extra shelf space where needed.

9. Bend hanger to U shape after cutting, and screw to underside of shelf to form men's hat holder. 10. Holders bent as at right, nailed to wall, hold women's hats. 11. Bend hanger back upward to hold scalded fowl while picking feathers.

12. Crinkle lower bar of hanger and hang from pole to make handy tie rack. 13. Bend 2 prongs in hanger, tilt upward and hang from pole in closet to hold pair of shoes.

14. Saw canvas or other heavy cloth over coat hanger to make laundry or clothespin bag which slides along clothes line or hangs in closet. 15. Hat holder for car is patterned after those used underneath theatre seats. 16. Straighten out the hook, push into hole drilled into top of a broomstick to form no-cost music rack. 17. Bend hanger into circle, slip socket into hook, tie on holly to form Christmas wreaths. 18. Hangers mounted as shown above make excellent braces for Christmas tree holders.

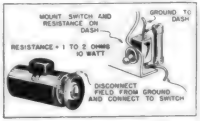
TROUBLE-PREVENTING AUTO HINTS



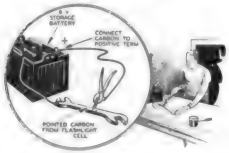
Clean Spark Plugs With Sand Blast Funnel

IT IS generally a long, tedious operation to clean spark plugs in the usual manner whereby the carbon deposits are scraped off with a knife—and the inside of the plug cannot be thoroughly cleaned unless the porcelain is removed. A large size funnel is soldered to a ½" pipe leading to an air supply tank. Fine beach sand is placed in the bottom of the funnel to a depth of two inches, a flat metal disc soldered over the top, and a hole cut for the plug. A rubber gasket glued around the hole insures a tight fit as the plug is held down for cleaning.—Bob Poulson.

Adjust Generator Charging Rate From Dash



BY INSTALLING this simple dashboard switch the charging rate can be changed over in a second from the maximum to a safe low charge for long trips, without even getting out of the car. Set the third brush to charge at around 18 amperes. Disconnect the field coil lead going to the grounded brush, splice it to an insulated wire and run it out through the generator to the dash. Connect this lead to one of the terminals of a toggle switch, and ground the other switch terminal to the metal dash. Now connect a 1 to 2 ohm radio filament resistance of 10-watt rating across the switch terminals to complete the job. Any section of a heating element may be used instead by adjusting its length until the charging rate is reduced to about 8 amperes. With the switch shorting out the resistance, the maximum charge is had.—J. A. Robson.

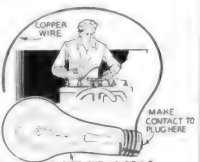


Mark Auto Tools With Electric Arc Pencil

BY USING this electric arc pencil any tool, no matter how hard, can be marked as easily as if with pen and ink, yet permanently. Remove the small carbon pencil from a flashlight cell and grind to a sharp point at one end. This carbon can be held in pliers which are connected to the positive terminal of a 6-volt storage battery, or a special holder can be made up. Ground the tool being marked to the negative battery terminal.—Ben Branch.

Burned Out Bulb Is Handy Spark Plug Tester

ONLY a burned out electric light bulb is needed to make this simple yet accurate spark plug tester. Select a bulb of the gas-filled type, and wrap 4 or 5 turns of copper wire around the threads. Bring the free end of the wire out in an 8" hook. To test the plugs, start the motor, touch the end contact of the bulb to the spark plug terminal, and bring the wire hook down to a grounded part of the car.—G. E. Van Horn.



Automobile Battery Kinks

TO EASILY clean auto battery terminals which have become badly corroded, pour boiling water over the terminals. Every trace of corrosion will be removed almost instantly, leaving clean, shiny terminal clamps. Be careful to keep this cleaning water out of the battery itself. No soda or chemicals need be used. Apply a coating of ordinary vaseline over all exposed metal parts to prevent future corrosion. If the cable clamps are badly corroded, it is by far the better policy to replace them. A loose battery terminal can blow out every light bulb in the car or it will blow the fuse.—Burley Evans.

Tiny Electric Motors Propel Cardboard Destroyer Model

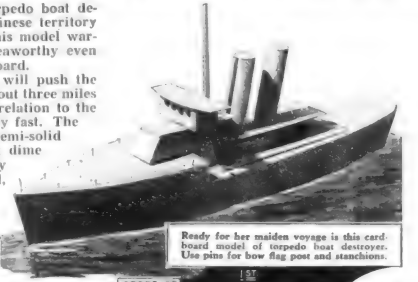
PATTERNED after the torpedo boat destroyers now used in Chinese territory to prevent river pirating, this model warship will be found quite seaworthy even though it is built of cardboard.

The tiny electric motors will push the boat through the water at about three miles an hour, a speed which in relation to the size of the boat appears very fast. The motors are taken from the semi-solid wooden boats being sold at dime stores. Either one or two dry cells per motor can be used, depending upon the speed desired. Those living outside large cities can obtain the motors from the manufacturer.

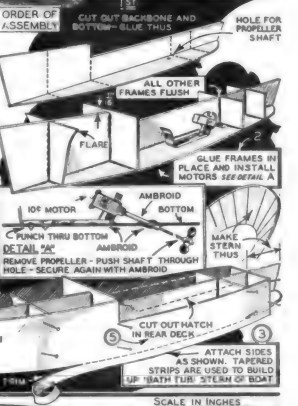
For the boat itself you'll need a small can of Ambroid glue, some photo mounting board or other heavy cardboard, and a few pins. A pair of sharp scissors and a few razor blades are the only tools needed.

First lay out on the photo board full size patterns for the side pieces, the backbone, and the bottom. Mark a center line on the bottom piece, and ambroid the backbone in place, holding a few minutes until dry. The frames are then cut out according to the

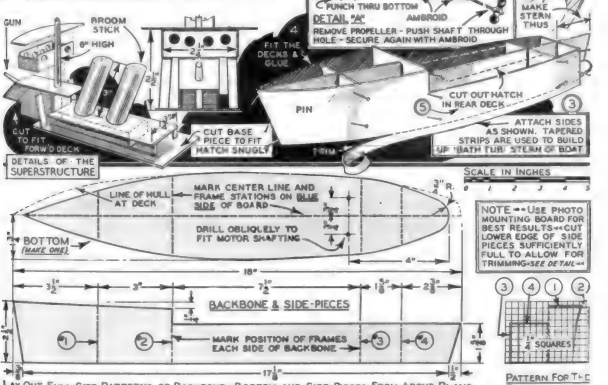
(Continued on page 120)



Ready for her maiden voyage is this cardboard model of torpedo boat destroyer. Use pins for bow flag post and stanchions.



In cutting side pieces make one left and one right, keeping blue side of mounting board on inside. All frames are rectangular except No. 1, which is flared as shown for bow. Hold parts in place with common pins until ambroid dries.



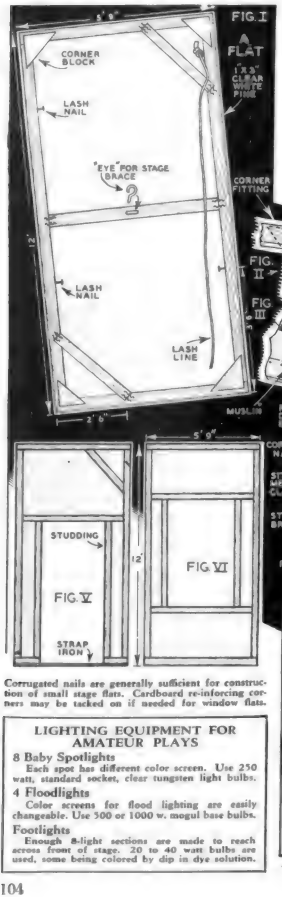
LAY OUT FULL-SIZE PATTERNS OF BACKBONE, BOTTOM AND SIDE PIECES FROM ABOVE PLANS

BUILDING *and* LIGHTING

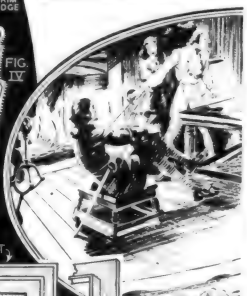
by **DAVID A. BROWN**

AMATEUR play production is fast becoming one of the popular recreations, with new groups of budding thespians being organized daily. In most of these there is plenty of acting talent, but a lack of experienced people to direct the staging of the plays.

No play can be truly entertaining if the scenery and effects are not convincing. Remember that all scenery and equipment must have the appearance of reality and solidity, yet be light and movable. Scenes must be changed between acts in not more than twelve minutes. In some cases the changes may be made by merely changing the position of doors and windows, and flooding the stage with



Stage braces in Fig. 4, fastened to floor with large screw-eyes, should be used on every flat having tendency to wobble. Trim edges of muslin with knife after pasting down on all sides with paperhanger's paste.



Corrugated nails are generally sufficient for construction of small stage flats. Cardboard re-inforcing corners may be tacked on if needed for window flats.

LIGHTING EQUIPMENT FOR AMATEUR PLAYS

8 Baby Spotlights
Each spot has different color screen. Use 250 watt, standard socket, clear tungsten light bulbs.

4 Floodlights
Color screens for flood lighting are easily changeable. Use 500 or 1000 w. mogul base bulbs.

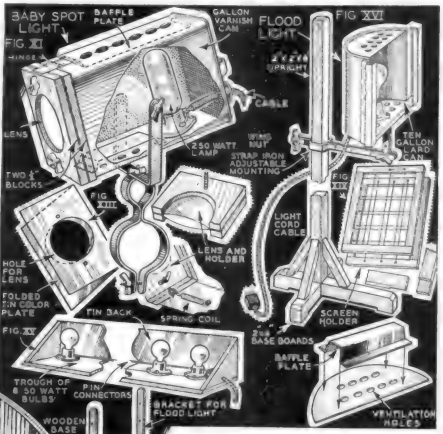
Footlights
Enough 8-light sections are made to reach across front of stage. 20 to 40 watt bulbs are used, some being colored by dip in dye solution.

Amateur STAGE Scenery

light of a different tint.

The number of standard pieces of stage scenery, known as "flats," which are required depends upon the size of your stage as well as upon the number of scenes in the play.

The outside dimensions of the standard flat are 12' high by 5' 9" wide. If your stage is low this may be made as short as eight feet. As a rule several narrower pieces, some as narrow as 18", are required to form jogs and alcoves in the



Drawings above show construction of equipment needed for lighting amateur stage productions. Daylight is always straw-colored rather than white; night is blue, purple, or green rather than black on stage. Colored gelatin sheets are sold by theatrical supply houses.

room. Stage directions for a play will indicate the essential shape of the setting.

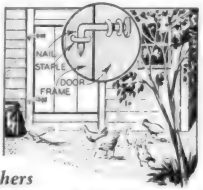
The flat frame is made of 1"x3" clear white pine, dressed to remove roughness. Lay out and assemble on the floor as shown in Fig. 1. Five and one-half feet of sash cord is knotted and passed through the screw eye attached to the inner edge of the right hand upright, 6" from the top. This is the lash line, by which flats are held together. Lash cleats are 6-penny nails driven into the uprights.

When the frame is completed, turn it over and attach a piece of muslin 72" wide and 4 yards long, with a tack in each corner. Draw the muslin taut with a row of No. 6 tacks completely around the frame and ¼" from the inner edge. Do not tack to the braces. Remove the first tacks from the four corners and paste the loose flap of muslin to the frame with ordinary paperhanger's

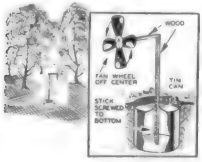
(Continued on page 126)

Simple Hinge for Light Doors Made of Nails

INEXPENSIVE hinges for chicken house, rabbit hutch and other similar light doors may be quickly made up from various sizes of nails. Bend two nails at right angles at about one inch from the point. Fasten each nail, point downward, to the sides of the door in the usual hinge position with staples, letting the bend come about one inch out from the edge of the door. Opposite these on the door frame drive two heavy staples, one for each bent nail, locating them so the nails will just slip through the arch when the door is snug.—John R. Marcy.



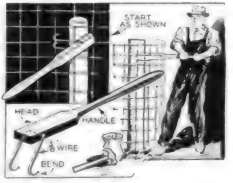
Windmill Scares Gophers



GOPHERS can effectively be driven out of orchards and grain fields by setting up a few of these wobbling windmills. A large tin can is buried in the ground, after a 12" high wood mast has been screwed to the bottom. The hole cut in the top of the can is just large enough to clear the stick. A cross arm mounted on this mast has a small fan wheel set off center on its end. The wobbling fan causes a constant vibration in the cross arm and shaft, which, amplified by the drum-like can, sends a rattle of warning to the gophers.—Chet Sullivan.

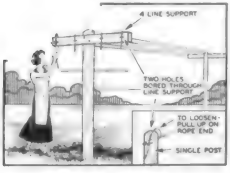
Handy Stretching Lever for Wire Fencing

AN EFFECTIVE stretcher for any kind of net wire fencing can be made for little cost. Shave off one end of a four-foot length of 2x4 to form a handle, then run a length of ⅜" rod through the other end and bend the ends into a hook as shown. The two hooks should be from six to eight inches long each. When building fences, the hooks are slipped into the wire meshes, and the lever end pushed behind the post. The handle is then pulled around until the fence is taut enough for stapling. Barbed wire can be stretched in a similar manner by replacing the hooks with single wire grippers.—A. H. Waychoff.



Knotless Adjustment for Clothes Line

CLOTHES lines can be instantly adjusted to any desired tension, yet never slip when loaded, if one of the supports is treated in the following manner. For each line drill two parallel holes about one-half inch in diameter. Thread the rope through one hole, around the back of the support into the other, then around the side of the support and under the rope loop first formed. To tighten, simply pull on the loose end. It will automatically jam tight when released. —W. E. Stewart.

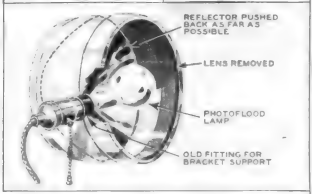


Use Rolling Pin to Round Concrete Edgings

WHEN finishing concrete steps, basement floors, or driveway curbs it is often desirable to round off the inside corners. An ordinary kitchen rolling pin makes a good tool for this purpose; when used as if rolling bread dough it will spread the finishing cement or concrete mixture evenly and smoothly into a neatly rounded contour. Rolling should be done just as soon as the concrete has set enough to permit removal of the forms.—Ray J. Marran.

Lighting Equipment Aids Photo Amateurs

With photoflood bulbs in reflectors not more than eight feet from subject, snapshots can be taken.



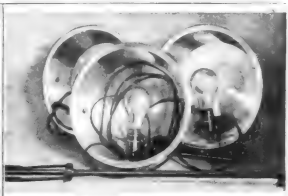
Conversion of auto headlight into photographic spotlight.

OBTAINING enough light and at the proper places is undoubtedly the greatest problem encountered by the amateur photographer making movies or still pictures at home.

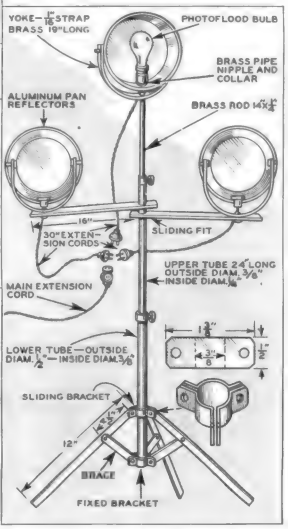
The construction of a floodlight and spotlight equal in performance to those in use in studios is covered in the accompanying sketches. The materials required are inexpensive and readily obtained at any hardware store.

The proper use of artificial light is one of the most intriguing problems in the art of photography. With a still subject use little light and lengthen the exposure to avoid glare.

It is not advisable to use a single source of light, for this will result in flatness and lack of modeling. The floodlight, by virtue of its three separate lights, will largely eliminate this fault.

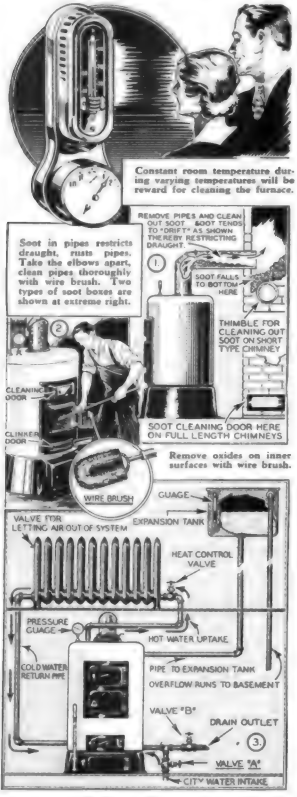


Reflectors of floodlight fold into compact kit when not in use. Top and side reflectors are mounted to pivot and tilt in any direction. Thin silk or tracing cloth in front of bulbs will soften and diffuse light for portrait work.



Base of floodlight is designed to automatically stay in position, either open or closed. Weight of side reflector arms keeps them locked at any desired height, but ready for instant adjustment. Use separate plug for each socket, since it may be desirable at times to use one or two reflectors at some distant point. Cut slots in bottom of sliding tubes, and spread apart to prevent wobbling. Brass is best for legs and braces if available, but strap iron will be satisfactory if painted. Reflectors are aluminum cooking pans.

Do You Know How to Clean a Furnace?



Typical layout of hot water heating plant. To drain water, close valve "A", open "B", and open all radiator air cocks. Turn valves back to original position to let fresh water in. Allow water to drain, repeating flushing out process two or three times to carry out all sludge in system. Close radiator air cocks, fill system, allow air to escape from radiators, and let in more water till gauge reads correct level.

Prepare your furnace in the summer for fall and winter heating comfort and for economy. You'll be pleasantly surprised at the saving in fuel bills the next winter.

IF YOU want economy and comfort this winter, clean the furnace. You'll be safe, snug and warm—and you'll be getting the most out of every ton of fuel.

All chimneys are, of course, built on the vertical. For this reason soot falls to the bottom. Well designed chimneys go clear to the floor, and have a soot cleaning door at the bottom. In other chimneys, the soot pot is not so deep, and there is a thimble there at the bottom for cleaning out the soot and ashes that accumulate.

Clean thoroughly, and re-seal the edges of the door or thimble with plaster of Paris. This plaster can be had from the local drug-store, and will set rapidly if you make a thick paste and put a handful of table salt in it.

This same plaster mixture can be used to seal the joints of the pipes after tearing them down, should it develop that there is an air leak which will impair draught.

Cleaning the Furnace Itself

During a season's use much soot and many forms of heavy oxide deposits will adhere to the iron surface of the furnace. These will be found in a dry, powdered form in the firebox itself, and in a more sticky, tarry form on top of the furnace and in the smoke by-passes.

For the purpose of cleaning off these non-radiating deposits, there is a cleaning door above the stoking door. Through this door the wire brush can be run and the deposits removed. Clean right down to the bare iron. Where such deposits occur, the heat will dance merrily by without imparting any of its content to the iron and thence to the air or water heating medium.

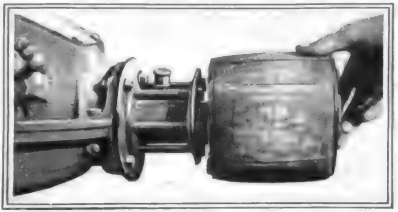
Also clean out the grates. Clinkers will accumulate and wedge into vital parts otherwise undetected unless this is made a part of the ritual. Then on some winter night when you need heat, the grate will refuse to function, and the heating plant will come in for a lot of condemnation not justly deserved.

The above treatment will suffice for hot air plants. In steam plants new water may be run into the boiler to the prescribed level as shown by the gauge on the boiler front, and that is all there is to it.

But with a hot water plant, the water itself will need replacing if you are to get maximum efficiency.

Power TAKE-OFF *Unit Fits Auto Engine*

AFTER an automobile engine has served its period of usefulness on the road, there are many years of service as a stationary engine left. Odds and ends of an old model "T" Ford can be put together at almost insignificant cost to give a practical power take-off unit for that old Ford engine—or with a few changes, for almost any other auto engine as well. This unit may be considered equally efficient, if not better than the factory made product, for it incorporates the much-desired roller bearing feature.



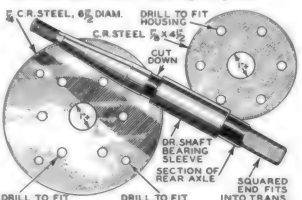
Completed power take-off unit mounts on end of transmission of Ford engine. Drive shaft bearing housing is tapped for grease cup to insure lubrication.

The power take-off pulley is best turned out of a solid block of elm, for this wood will not check in damp weather.

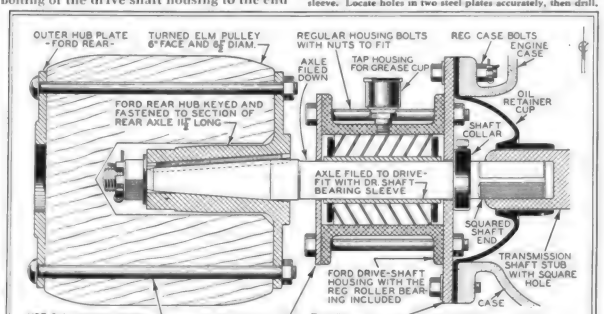
A 11½" length of rear axle shaft is cut from the hub end, and dressed down with a mill file until the drive shaft bearing sleeve can just be forced on. By careful fitting here, the usual shaft collar can be dispensed with.

The regular hub is bolted to the short shaft, and the pulley then bolted to this hub in the manner shown, a large hole being bored to accommodate hub and axle.

Two circular discs are cut from cold rolled sheet steel, the larger being used for bolting of the drive shaft housing to the end of the transmission, and the smaller to keep the axle and roller bearing in place.

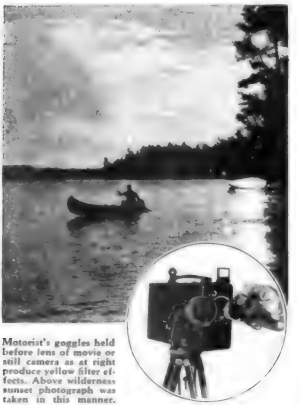


File down 11½" length of axle shaft, force on bearing sleeve. Locate holes in two steel plates accurately, then drill.



Cross section of complete unit, showing how bearing housing is fastened to steel plate, and plate in turn to transmission. Collar with set screw prevents shaft from sliding. End of shortened shaft is filed square to fit into transmission hole.

Hold Sun Goggles Before Camera for Novel Cloud Effects



Motorist's goggles held before lens of movie or still camera as at right produce yellow filter effects. Above wilderness sunset photograph was taken in this manner.

EXCELLENT cloud and silhouette effects can be obtained by amateur photographers with an ordinary pair of motorist's yellow goggles, when standard yellow color filters have been forgotten.

The yellow glass must, of course, be optically clear and free from finger marks. Because of the density of such filters, it will be necessary to open the shutter at least three stops larger, depending on prevailing lighting conditions and the type of film used.

Snapshots may be taken directly into the sun without causing halos. By using red-tinted glasses white sunsets can be obtained—here, however, the exposure must be greatly increased. Cloud formations will come out surprisingly clear, while nearby objects will be darkened in beautiful silhouette.

Glass Jug Is Microscope Cover

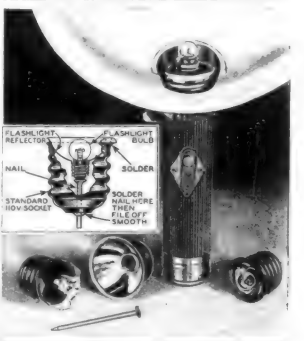
IT IS highly important that all dust be kept out of the microscope when it is standing unused. The tiny scratches made when rubbing off hard dust particles with a cloth will often ruin an otherwise perfect lens, so it is by far the better policy to provide some sort of cover.

By cutting off the bottom of a gallon glass jar and covering the rough edge with adhesive tape, an ideal cover is had. The cork is, of course, kept in place continually.

Scratch a line around the bottom edge of the jug, as evenly as possible, with a good glass cutter. Now pour hot water into the bottle rapidly, using a funnel. The bottom will fall out, cracking neatly along the inscribed line. Cover the rough edges neatly with adhesive tape to make an air-tight job.

Glass jar with bottom cut off makes ideal microscope cover.

Testing Photo Flash Batteries



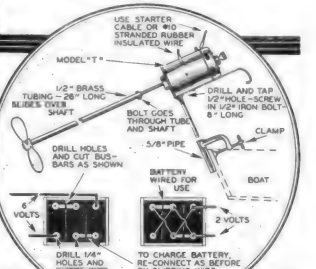
Mount 3-volt flashlight bulb in standard bulb base as shown above to make photo flash battery tester. If bulb lights, batteries are strong enough to set off photo flash bulb.

TO MAKE certain your photo flash gun battery is strong enough to set off the bulb, it is always best to carry a test bulb with your outfit. A flashlight bulb will give a positive indication of the condition of the batteries, but must be mounted in a regular light bulb base first.

The reflector from a discarded flashlight is soldered into the screw base of a house light bulb, a nail being soldered in place to make contact between the center buttons. Now insert a 3-volt flashlight bulb.

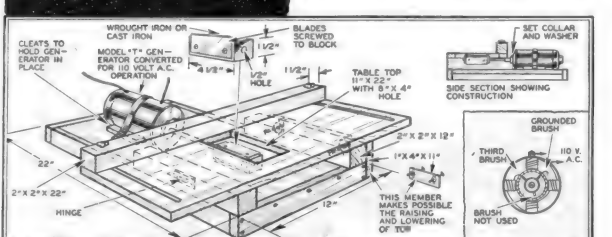
Use Auto GENERATORS *or Starters for* ELECTRIC *Outboard, Jointer, Wind Plant*

By making a few changes in wiring or mounting, many new uses can be found for old auto starters and generators.



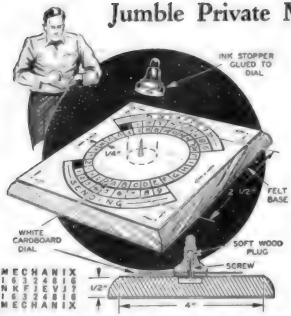
ELECTRIC TROLLING MOTOR FROM STARTER
Model T as well as most auto starters can be used with few changes for this electric outboard. With one fully charged battery in test run it pushed a large skiff at 2 miles per hour for 12 hours. Change battery as shown, using heavy copper or brass rod for new connections. Bolt strap iron handle to starter for steering, mount 8" bolt as shown to slip into pipe clamped to boat. For best results clamp should be welded to pipe. Slip propeller shaft tubing over starter shaft, and fasten with bolt. Use outboard propeller, or make a 2-blade propeller.—A. M. Briggs, Vallejo, Cal.

INCREASING EFFICIENCY OF WIND GENERATOR
To obtain success with direct drive wind-driven generator for charging storage batteries, select older type generator. New car generators start charging at 1000 r.p.m., while older units start at about 600 r.p.m. Since this is too fast for direct drive, the field coils must be reconnected in parallel as shown. Most units will then start charging at around 375 r.p.m. When using a 6-ft. diam. propeller with 6" pitch, generator should start charging in 7-mile wind, and deliver normal charge in 13 m.p.h. breeze. No gears are needed to raise speed.—C. W. Trost, Rice, Kans.



"T" FORD GENERATOR DRIVES SHOP JOINTER
Either Model T Ford generator or starter can be used to drive this jointer and molding cutter, depending on whether 6 or 110-volt operation is desired. When using generator, convert for 110 volts a.c. operation as at right, and add ½" steel extension shaft and coupling. ½" USS threads can be cut directly on starter shaft. Knife holder is drilled out from solid stock and bolted on shaft. Knives can be made from old mill band saws or mill files. Spindle will take standard attachments.—T. D. Enete, Jonesville, La.

Jumble Private Messages With Code Device

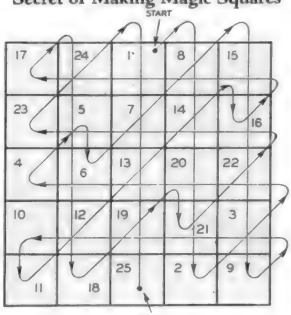


To send word "Mechanix" with key number of 163248, place M opposite black space on "Sending" side, get code letter opposite 1; repeat for each letter. To decode, write key numerals under message, set N opposite "Receiving" black space, and read M opposite 1. See example above.

MESSAGES are transposed into a meaningless jumble of letters that baffle even experts just as effectively by this simple device as by the more elaborate war-time code machines.

Each correspondent must have one of the instruments, and must agree beforehand on a secret key number. Write out the message, placing under each letter one of the key numerals, and repeating the numeral sequence as often as necessary. The device is then used to get the coded letters. With practice, messages can be coded and uncoded with ease and rapidity. Omit unimportant words when using code.

Secret of Making Magic Squares



All columns, horizontal, vertical, diagonal, add to 65 in this magic square. Follow arrow for sequence in filling squares. Rules here apply with odd number of squares on side.

THOUGH most puzzle fans are acquainted with the "magic square," few are able to construct the larger examples without tedious trials.

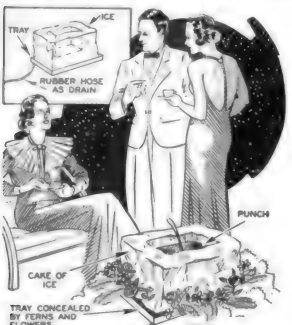
In a magic square of one type, consecutive numbers are used, and the columns add up to the same either horizontally, vertically, or on the two diagonals. Once the secret of making them is known, they can be laid out as fast as the squares can be filled in.

Start by placing 1 in the top row, center square. The rule is: continue the numbers consecutively and diagonally upwards to the right. When a number falls outside the square at the top it is placed at the bottom of the row to which it belongs. When it falls outside at the right, it is placed at the extreme left. When the space for a number is already filled, place it in the square below. Instead of running out of the upper right corner, drop the number one space.

Punch Bowl Carved From Ice Cake

WHERE beverage bowls large enough for a party are not to be had, this polar punchbowl, carved out of a solid block of ice, will serve the purpose and provide a little surprise for your guests.

Select a 100-pound cake of ice which is free from air streaks and bubbles. Chisel out an oblong hole, leaving side walls and bottom about eight inches thick. Set a drip pan under the cake, and attach a drain tube to carry off the water.



Bordered with ferns and flowers, novel polar punchbowl arouses favorable comment from party guests. Ice cake will last all evening, keeping beverages always cold.

How to LAY OUT *and* CUT *a* TENON

by **VERNE C. FRYKLUND**
Industrial Education Division
University of Minnesota

IN ORDER to complete your training in cutting a mortise and tenon joint, which is regarded as the strongest of all joints for furniture making, the laying out and cutting of the tenon is presented this month.

Just as the mortise is easy to cut, when you know how to do it properly, so is the cutting of a tenon a rather simple process. Good furniture, doors, windows, panels, and frames requiring special strength must have the mortise and tenon construction in their making.

There are many variations of the mortise and tenon joint. A few of them are shown in Fig. 1, but the blind mortise and tenon is the most commonly used. All the variations of this joint are cut in the manner here described.

It is important to keep in mind that the drawing from which you work should give the size of the joint to be used. Refer to the mortise-cutting article in the October issue for suggested sizes if your drawing is not complete. A tenon, as a rule, should be made approximately two-thirds as long as the thickness of the stock into which it is to fit. For example, should you plan to fit a tenon into a piece of stock 1½" thick, the tenon should be an inch long and the mortise would be cut to such a depth plus about 1/16" to make certain of clearance.

In laying out for all construction in wood, especially joints, make sure that you do all your laying out from the working face and working edge. As a rule, a tenon is cut on each end of a rail, and therefore this description will follow this assumption. The distance between the two tenons, from

(Continued on page 118)

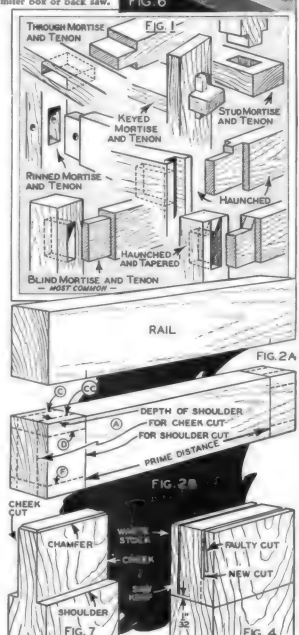


Fig. 1 shows common mortised joints; cutting steps below.

Indian Head Pennies Mounted on Trapshooters' Trophy

With 500 rare Indian head pennies brazed to this silver loving cup, entrants in the annual "Indian trapshoot" at Del Monte, Calif., have an interesting trophy to "shoot at."

INDIAN head pennies—500 of them, and many quite rare by now—go to make up a novel trophy cup awarded the winner of the annual "Indian trapshoot" at Del Monte, California, this year. The polished bronze coins have been carefully and artistically arranged around a regular silver cup, and each carefully brazed in place.

Each year the "Indians," a wealthy organization of trapshooting enthusiasts, holds a shoot which attracts hundreds of scatter gun followers.

Biggest Mistake Sells for $25,300

EIGHTY-SEVEN years ago two stamps were placed on a letter addressed to Bordeaux, France, by a resident of the British colony of Mauritius. Recently that same cover, originally costing 6 cents, was sold on the auction block in London for $25,300. The most famous mistakes in the world—the 1d and 2d blue Mauritius stamps which read "Post Office" instead of "Post Paid"—are on the envelope.

Graf Zeppelin Again Flies Mail

WITH eleven round trip flights from Germany to South America scheduled for the *Graf Zeppelin* this summer, collectors of dirigible mail service covers are adding

(Continued on page 116)

Navy Vessel Cover Data Sent Free

THE collecting of covers cancelled on vessels of the U. S. Navy is fast becoming one of the most widely followed branches of stamp collecting. The unusual navy cancellations have colorful cachets.

Addresses of all U. S. Navy vessels now using cancelling stamps, together with simple instructions for securing attractive naval covers from them, will be sent to any one interested by George W. Hester, P. O. Box 94, Morristown, N. J., if a commemorative stamp is used on your letter and a stamped, self-addressed envelope is enclosed.

Cover carried on one of eleven regular trans-Atlantic flights of Graf Zeppelin from Friedrichshafen, Germany, to Pernambuco, Brazil, this summer. Note picture of the late President von Hindenburg on the German airmail stamp.

TNT ON WHEELS!

MORE "punch" than a motorcycle motor has ever had before—that's what is shooting Harley-Davidsons ahead to victory on track and hill the world over.

Wait till you *feel* the thrill of that surging power under you as you zoom up grades and flash down straightaways! There's no ride like a Harley-Davidson ride—and never before has there been a Harley-Davidson to equal the 1934 models with their marvelous TNT motors.

Your nearby Harley-Davidson dealer will be glad to show you how quickly you can learn to ride a Twin or Single — and how easy they are to buy on his time-payment plans. See him soon — and mail the coupon.

Ride a

HARLEY-DAVIDSON

Mail this Coupon

Harley-Davidson Motor Co., Dept. MM, Milwaukee, Wis.
Interested in Motorcycling. Send illustrated literature. Postage Stamp is enclosed for your cost of mailing.

Name _____

Address _____

My age is: ( ) 15-19 years, ( ) 20-30 years, ( ) 31 years and up, ( ) under 15 yrs. Check your age group.

M-M Readers Are Offered Cards

This foreign scenic view, framed by 1-groschen Austrian stamps, makes interesting addition to any stamp collection.

OF INTEREST to both stamp and post-card collectors is the offer of an Austrian correspondent to send to MODERN MECHANIX AND INVENTIONS readers a postcard view completely framed by Austrian stamps. A midget scenic photograph is framed in on all sides by a block of eight 1-groschen Austrian stamps, all canceled as usual by the postoffice.

Readers desiring this novel souvenir should send one international reply coupon with their request to Rudolf Trimmel, Wien X, Luxenburgerstrasse 26, Austria, Europe. Be sure your address is clearly printed on your letter.

The reply coupons are obtainable at any postoffice, and cost nine cents each. Where higher values of stamps are desired on the view card, readers should send two or more coupons for each card. No more than three cards will be sent to any one reader.

Graf Zeppelin Again Flies Mail

(Continued from page 114)

many outstanding new covers to their albums.

The summer flying season for this year began on May 26, and will close with the last departure from Friedrichshafen on October 27.

The New York representatives of the Luftschiffbau Zeppelin are handling covers on any of the flights for $1.50, and postcards for 75 cents.

ADLETS FOR HOBBYISTS

STAMPS

CAICOS ISLANDS—Also early United States, Uganda, Congo's, Nicaragua, Monte Carlo, Niger Coast, Canada, Newfoundland, and Ubangi — "Countries Collectors Haven't Got" — Free for 5c postage. Hurry for yours. Now. Empire Stamp Company, Dept. M.M., Toronto, Canada.

HEADQUARTERS—Stamp Collectors! Complete stock Penny Approvals and low price sets. Request selection. Elyria Stamp Company, 437M, Elyria, Ohio.

FREE Gorgeous packet, including Spanish airpost set, triangle, ships, maps; only 3c postage to approval applicants. Imperial Stamps, Fontana, Calif.

SOUTH Sea Packet—all mint—direct from mid-Pacific: Aitutaki, Papua, Tonga, etc., 10c silver with amazing offer of free stamps. No approvals—nothing to buy. List with valuable illustrations included. South Sea Imports, Box 124B, Lake Field, Honolulu, Hawaii.

EXCELLENT Penny Approvals. Westminster Stamp Co., Box 392-C, Evanston, Illinois.

BREAKING up valuable collection for estate at attractive prices. Name your country and requirements first. Dealers write. Smith Novelty Jobber, Miami Beach, Florida.

YOU'VE tried the rest now get the best! We have answered all advertisements, compared premiums, approvals, etc., and absolutely proven that ours are far superior. Send 10c for "Challenge Offer" with approvals. Bargain Stamp Service, 1332 South Hope, Los Angeles, Calif.

FREE! Three Spain Airmails or Russia Ethnographic Issue. Postage 3c. Roberts, 901T Fourth, Bay City, Mich.

STAMPS Sent on approval. 50% discount. Fred Herzberg, 197 Grantley Ave., Elmhurst, Illinois.

SENSATION Packet: Coreas, Liberia, triangles, British Colonials 10c. A. Steele, Springdale, Pa.

MAMMOTH Mystery packet of rare stamps for only 10c to serious approval applicants, also valuable free premiums with every selection afterwards. Our stamps are better and our service is different. Fair-Play Stamp Service, 1215 Browning Blvd., Los Angeles, California.

COLOSSAL Packet of Canada and other British Colonials, including commemoratives and pictorials only 10c to applicants for super-foreign approvals, economically priced. Swalley Stamp Service, 1119 Trenton, Los Angeles, Calif.

AIR MAILS—From Brazil, Chile, Colombia, Ecuador and Mexico, all for only 10c with our double premium penny approvals. Progress Stamp Service, Franklin Park, Ill.

DIAMOND and Triangle Stamps in marvelous packet—37 different Liberia, Manchuko, Salvador, Charkhari, Patiala, Inini. Includes stratosphere balloon, maps, savages, airplanes, scenes, ships, birds and beasts. No European! Only 10c to approval applicants. Gardner, 5220 Cuthbert, Baltimore, Md.

CHOOSE your premiums! Jungle stamps, animal, bird, airmail! Triangle and map stamps! Pick any item from our big approval selections. Inclose 5c postage. Stamp Importers, Akron, Ohio.

STAMPS sent on approval. 50% discount. K. N. La Bar, 261 Jackson St., Huntington, Ind.

COINS

HIGHEST Prices paid for Indian Head Pennies. Send dime for list of those wanted. Coin Shoppe, Box 407-MM, Ottawa, Ill.

LINCOLN and Indianhead pennies wanted. Will pay $2.00 each if more than 10 years old. Certain pennies worth $60.00. Send dime for catalog. Century Coin Co., Box 234A, Toledo, Ohio.

30 DIFFERENT U. S. stamps and list of prices paid for all Indian Head Pennies 10c. Coin Shop, 2422 Reid St., Flint, Michigan.

$5 to $500 EACH paid for Old Coins. Keep all old money. Get posted at once. Send 10 cents for Illustrated Coin Value Book 4x6. Guaranteed Buying and Selling Prices. Coin Exchange, Box 17, Le Roy, N. Y.

OLD MONEY Wanted. $5.00 to $2,500.00 each paid for old coins. Buying catalog 10c. Robert Cohen, Box 483, Muskogee, Okla.

New MILEAGE RECORDS

WITH

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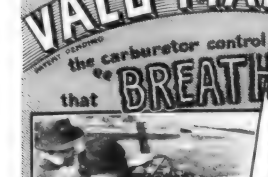
INSTANT STARTING

the carburetor control that "BREATHES"!



What Vacu-matic users say:-

CHRYSLER
Have tried the Vacu-matic and it sure is fine. Better pick-up with a 30% gas saving.—John C. Martin, Pa.

V-8 FORD
I installed both Vacu-matics and they work excellent. On my own '32 Ford I notice wonderful performance in pickup, getaway and gas saving.—Burt Burnett, Mich.

BUICK
Everything you claim about Vacu-matic is true. I increased 20 miles to the gallon. Before I got 11 gallon. Be- averaging 15½ per gallon. C. Constantino, Fla.

PLYMOUTH
I am amazed at Vacu-matic performance. It's giving me 5 more miles per gallon.—Walter Zielinski, Ill.

CHEVROLET
Please send me a Vacu-matic for a Master De Luxe Chevrolet. Have had 4. The Vacu-matic on my 1937 Chevrolet jumped from 18 to 7 miles per gal. with Vacu-matic.—Paul P. Haas, Mass.

OLDSMOBILE
I am well pleased with Vacu-matic on our Oldsmobile. A test proved it to give 1½ miles per gal. Before we considered 15 good.— Arthur Williams, N. Y.

SAVES $180 A YEAR
On my Plymouth I obtained an average of 7 miles per gal. on my last 4 tanks. This means a saving of $15 a month or $180 a year. —S. S. Peck, Calif.

ALL WELL PLEASED
Enclosed find order for 1 more. Everyone I have sold is saving from 4 to 6 more miles per gallon. I have 5 more orders for Vacu-matic. Everybody is well pleased.—J. O. Cattl, Texas.

MODEL A FORD
Have been using the Vacu-matic for a month. I used to get 20 miles per gal. Now I get 30 to 31 miles. It's amazing the difference it makes.—James W. Barr, Canada.

NASH
On my Advanced 6 Nash gained 17½% in mileage. The car will idle down to 1 miles an hour and then take gas without a complaint. — J. Showalter, Mo.

FRANKLIN
With Vacu-matic I have increased my mileage from 10.1 to 14.5 miles per gallon. I figure I save over $75.00 a year in gasoline. — R. K. Radtke, Wis.

DODGE
Just completed 5510 miles on 242 gallons, in one day. Dodge 6 this time. Have used Vacu-matic 1 year. Average 30 miles per gal. only. —Al Ermenna, Calif.

USERS REPORT
3 to 7 MILES MORE per gallon
MOTORIST SAVES $180.00 a YEAR

GUARANTEED GAS SAVINGS!

AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, greater speed and smoother running . . . unfolding a new driving thrill for you!

Entirely New — Nothing Like It!

The self-starter—four wheel brakes—knee action—streamlining . . . and now VACU-MATIC! The greatest motor improvement of recent years! With it, engineers have achieved a practical means of AUTOMATICALLY balancing air and gasoline in correct proportions for ALL speeds! Functioning directly with the manifold vacuum, VACU-MATIC actually "breathes" when needed, giving your motor correct combustion. Sharply cuts fuel wastes, saves dollars in gas costs, reduces carbon and gives your engine new pep, greater power and longer life.

Fits All Cars

VACU-MATIC is constructed of six parts, electrically welded into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

Agents and Salesmen

If you are interested in earning up to $15 daily, check coupon. Exclusive territories now being created.

The VACU-MATIC Co., Wauwatosa, Wis.

The VACU-MATIC proves itself on every car. It is guaranteed to give worth-while gas savings, quicker pick-up, and more power or it costs you nothing. Why get poor mileage when it is so easy to save gas with VACU-MATIC!

Free Details

Learn about this remarkable device that so greatly affects the entire performance of your motor. Learn why your car is costing you extra money to operate without VACU-MATIC. See why your VACU-MATIC equipped car will leap away from traffic without sputter or hesitation. Discover a new driving thrill and enjoy the savings. Get the facts! Write today!

FREE OFFER COUPON!

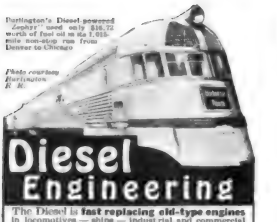
THE VACU-MATIC COMPANY
85 W. State St., Wauwatosa, Wis.
Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

Name .....

Address .....

City ..... State .....

☐ Check here if interested in selling proposition.



Burlington's Diesel-powered "Zephyr" used only $16.72 worth of fuel oil in the 1,015-mile non-stop run from Denver to Chicago

Photo courtesy Burlington R. R.

The Diesel is **fast replacing old-type engines** in locomotives — ships — industrial and commercial power plants — motor cars and trucks — aircraft — tractors. As a result, **many old jobs have been greatly changed or actually wiped out.**

New Jobs For Old

Every **industrial change** throws many good jobs into the discard — but it creates many better jobs. The **automobile** ruined scores of industries based on providing horse transportation — but the motor industry employs even greater armies of workers. **Radios** supplanted talking machines — **electric refrigerators** wrecked the iceman — **air conditioning** is driving out old-fashioned heating and ventilating systems.

Diesel Engineering is the great opportunity of today. The field is developing with amazing rapidity — on land and water and in the air. **This is your opportunity** to get in on the ground floor of a new and prosperous industry that will provide **plenty of good jobs** during your lifetime.

Is Your Job Safe?

There is a **growing scarcity of men** trained to install, operate, and service Diesel engines. New Diesel Engineering Course, **just released for home study** by one of America's leading educational institutions — will give you, in a short time, thorough training in modern Diesel engine practice. **All tools furnished.** Send TODAY for Free Bulletin. No obligation.

American School

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GOOD JOBS

Learn RADIO-TELEVISION ELECTRICITY-TALKING PICTURES

Times are getting better. Trained men are getting jobs. National will quickly train you to qualify in all branches of radio, television, talking pictures, broadcasting, sound-reinforcing, and general electricity. Thorough, practical training. Over $100,000 in modern equipment. National graduates in demand. Regardless of age or education you can learn profitable trades in a few months.

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and many other jobs

EARN ROOM AND BOARD WHILE LEARNING

75% of our students earn living expenses while receiving training. We help you get a job. For limited time will allow your coach railroad fare to Los Angeles.

TRAIN IN LOS ANGELES

This is the ideal City. Center of Greatest Activity in Radio, Talking Picture and Electricity. 20,000 successful graduates. School established 30 years. Send for free descriptive book and enrollment details.

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How to Lay Out and Cut a Tenon

(Continued from page 113)

shoulder to shoulder, is called the prime distance. Fig. 2B.

Determine the prime distance and the size of the tenon from the drawing.

Begin at one end of the rail. Lay off the length of the tenon and make a knife mark. Add the prime distance to this and make another knife mark at the other end.

At each point, with the try-square and knife, score the line around the stock until the lines meet. Make clear-cut single lines. A scratched line will not do. Keep the handle of the try-square always in contact with the working face and working edge. This step will give you line A, Fig. 2B.

Marking Gauge Speeds Work

Set the marking gauge so as to give the depth of the shoulder. With the head of the marking gauge against the working face, score a line around the end of the stock as shown by the broken line, C, Fig. 2B.

Add the thickness of the tenon to the first setting and score line CC being sure to gauge from the working face as before.

Should you need a tenon with four shoulders repeat steps 4 and 5 by gauging from the working edge. This would give lines D and F, Fig. 2. Whenever you can, however, use only two shoulders. A four shoulder tenon serves only to hide a poorly cut mortise.

Fasten the stock securely in the vise in position as shown in Fig. 3. Use a back saw, or panel saw, and cut in the waste stock, starting on the corner nearest you. Continue sawing until a diagonal cut is taken as shown by the broken line in Fig. 3. Keep the thickness of the waste stock the same at all points.

Having cut diagonally to the points as shown in Fig. 3, reverse the stock in the vise and repeat the sawing. Stop sawing about 1/32" from the shoulder line. Fig. 4.

Place the stock in the vise in an upright position as in Fig. 5 and continue sawing the tenon. You will find that the two diagonal kerfs serve as guides so you can saw accurately.

Split Knife Lines With Saw

To saw the shoulders, place the stock in the vise, or against a bench hook as in Fig. 6. Take it easy, relax as you saw, and see if you can split the knife line leaving half of it to form the edge of a perfectly straight shoulder. Remember that you should take plumb cuts leaving flat surfaces.

Should you saw a little inaccurately at first, use a chisel for trimming surplus stock, but do not plan always to use a chisel for trimming. A good mechanic can cut a tenon accurately by using only a saw.

Chamfer the end of the tenon slightly so that it will fit easily into the mortise.

When you put the tenon into the mortise it should fit snugly, but not so snug that it must be forced by pounding. It should fit just snug enough so, when you withdraw it, there is a sound like that made by pulling a cork out of a bottle.

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FREE 24 PAGE BOOK

MAKE MONEY
CASTING LEAD TOYS

GET this complete outfit. Learn how metal castings are made. It's fun to cast lead soldiers, animals, airplanes and other metal figures. Make all the toys you want. Junior Caster is a complete outfit for casting and coloring the largest finest toys. You can sell the toys at a good profit. Full details furnished in 24-page illustrated book.

Fascinating! ***Educational!***

SEND FOR FREE ILLUST. BOOK

Complete Outfit... $2.50

Each Junior Caster Outfit comes in a large, attractive box and includes a complete set of moulds for making 3 different large figures, also handles and clamp, lead, ladle, 4 cans of paint, and 2 brushes.

See Junior Caster at toy dealers, or hardware and department stores. If they can't supply you, order your choice of outfits on the coupon below.

EASY AND PROFITABLE TO OPERATE

It's easy to make fine toys with Junior Caster, like the ones you see in the stores. You can sell them at a profit

MAKE OVER 200 TOYS AN HOUR

It won't take long to make enough toys to pay for your Junior Caster Outfit, and make real profits.

Extra Moulds . . . 95c
Choice of 128 Subjects

All subjects can be made with one outfit, by simply buying extra moulds. Each mould makes 3 different, large figures. Choose from subjects such as Historical Figures, Sports and Athletics, Farm Subjects, Western, Wild Animals, U. S. Navy, U. S. Army, Continental Soldiers, and many others.

Rapaport Bros.,
717 W. Ohio St.,
Chicago, Ill.

Enclosed find money order for $..... Please send (Postpaid in U. S.) JUNIOR CASTER ☐ Standard $2.50 ☐ Electric $5.
Check model wanted. ☐ Wild-West Cowboy. ☐ U. S. Marine Gunners. ☐ U. S. Soldiers. ☐ Send FREE BOOK.

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20 SUBJECTS

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NEW BAFFLING TRICK

READ the BACKS Of Any Pack Of Cards

Turn up ACES, KINGS, DEUCES, or other cards at will. Mystify your friends with this bewildering new trick. Tell any card in deck by looking at the back! Complete instructions 50c (coin). W. M. DAVIS

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Send FREE booklet, *Opportunities in Modern Photography*, and full information.

Name _____

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Make Records With Your Radio Set

(Continued from page 93)

radios not having these terminals, connections are made to the plate and cathode prongs of the detector tube with a wafer. With some microphones the input transformer will not be necessary.

The equipment is now ready for use. Turn on the radio and the phonograph motor. Place a half-pound weight on the pick-up unit to make the needle "cut" properly, start it in the groove and begin to speak into the microphone. By watching the record you will know when to stop speaking.

The record can be played back as soon as it is made. Reconnect the speaker and connect the pick-up to the phonograph terminals of the set in place of the output transformer. Remove the weight when playing the record.

It is a little more difficult to connect the recorder to a receiver having a dynamic speaker. In many sets the speaker has a plug-in cable—here it is only necessary to attach the pick-up leads to the voice coil prongs (the two small prongs), using a wafer if desired. Attach to the G and P prongs if you have a 5-prong plug. After making this connection replace the plug in its socket.

A 50,000 ohm potentiometer in series with the pickup will protect the unit from burnouts and provide at the same time a convenient volume control. A 2 mfd. 400-volt condenser gives the same protection.

Where the dynamic speaker is directly connected to the set, wafers can be slipped under the output tubes to obtain the pick-up connections. Wafers for various types of output stages are shown in the sketches.

In recording radio programs the pick-up unit alone is used. The radio is turned on and the desired station tuned in. At the desired time place the pick-up on the record.

Tiny Electric Motors Propel Model

(Continued from page 103)

squared paper pattern shown, and glued in place in the same manner.

Fill in the stern section with wedges to give a well rounded appearance. Smooth over any rough joints with fine sandpaper.

Motors should be ambroided in place, one on each side, before the sides are put on. Take off the propellers, drill an oblique hole through the bottom piece, and press in the motor tubing.

The deck and superstructure can now be glued in place, and the battery hatch cut out with a razor blade.

Waterproofing of the hull is done by thoroughly impregnating with paraffin wax. Brush the wax on rapidly, being sure it is very hot and penetrates the cardboard.

Finish the boat off with a good coat of Puritan Gray enamel, the closest approximation to the usual Navy gray. The general impression is the thing when the boat is out on the lake, so little details of deck work such as port holes, running lights, and railing can be omitted entirely.

Thank You for Mentioning Modern Mechanix and Inventions for November When Writing to Advertisers

New 6-INCH JOINTER by "Delta"

SPECIAL FEATURES

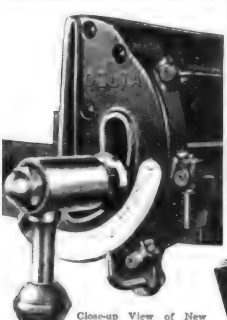
of New "Delta" 6-in. Jointer

1. New Patented Delta fence with 3 Automatic Stop Positions;
2. Full 6-inch Capacity;
3. New Free Swing Dual Control Handle;
4. Cuts up to ½-inch deep rabbet;
5. Long Hollow-cast Tables;
6. Special Dove-Tailed Ways on which Tables ride.

And many other unusual features and improvements.

NEW TOOLS—NEW IMPROVEMENTS IN 1935 "DELTA" LINE

The new 6-inch Delta Jointer is but one of the many new improvements and tools announced this year by Delta engineers. This year the Delta line of motor-driven woodworking tools is more complete than ever before. Delta standards of efficiency, quality, and convenience have been strictly maintained—and Delta prices still kept at their low levels. Good compact motor-driven tools are within the reach of all. Every woodworker will find the new 1935 Delta line of unusual interest.



Close-up View of New 6-inch Delta Jointer showing New Free Swing Dual Control Handle—but one of the many special features of this unusual Tool. Note 3 Automatic Stops for setting fence quickly in most-used positions.

MAIL COUPON FOR 1935 "DELTA" Catalog

Within a short time, the 1935 catalog of Delta quality tools will be off the press. It is crowded with photographs and information about the new line of 1935 Delta tools. It shows how Delta tools are built to stand the grind of production work, and yet are so low priced as to be within the reach of all. So your name will be placed on the mailing list to receive the 1935 Delta catalog without delay. Enclose only 10 cents at same time for Book of Practical Delta Projects, 32 pages of new and novel things to make with over 100 blue prints, working drawings, photographs and illustrations—and complete directions.

NEW BOOK for WOODWORKERS

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What Happens to New Gold?

(Continued from page 71)

values vary and since payment must be made on the basis of net gold or silver value in the individual batch, the first step is to determine the exact metal content of each lot.

Here, for example, is a bar numbered 4998. Two men have weighed it, checking their figures to within 1/100 of an ounce.

Now if bar 4998 were sampled just as it comes in, one end might show one degree of fineness; the other end another degree. In order to get every gram of that bar exactly like every other gram, the next step after the preliminary weighing is to make the batch exactly alike in all parts.

Melting Gold in Super-Heated Crucibles

Into the melting room goes bar 4998. It is put into what is known as a "K" crucible, which vary in size to accommodate different batches of gold. Each crucible is placed in a jacket; hence if the crucible itself breaks the contents will not be spilled. Borax flux is then added as mixed air and natural gas under pressure leap into a roaring fire around the jacketed crucible. There is a blow-torch roar to the fire. Temperatures vary from 1200 F. to 2000 F.

In the last step of this heating process, the cooled borax "slag" is ground into a fine dust, allowing even the tiny amount of gold it may have caught up to be "panned" and restored to batch 4998. Now the gold is poured into a mold, allowed to cool, and is ready for reweighing and assay.

Three men now weigh 4998. Again their independent figures must check within 1/100 of an ounce. But to the uninitiated there seems to be a discrepancy in their results. Before melting, the bar weighed 79.14 ounces, now it weighs only 78.44 ounces. The apparent loss is only dirt which has been burned out of the metal.

Double-Checking the Assay

After the mint authorities are satisfied that every fleck of 4998 is like every other tiny bit, the bar is ready for assay. If the batch is very small, two chips are taken; if it is large enough, two holes are drilled through the bar. These two small samples are given, one each, to two assayers whose findings must balance.

At this point bar 4998 loses its identity. With its receiving record complete, this batch of more or less pure gold leaves the deposit division and enters the refining department.

The final step in securing pure gold is by electrolysis. This is exactly the same process as "electro-plating." In an acid solution, with a mild electric current passing through it, the immersed pure gold separates out and collects on the cathode. With the metal thus electro-chemically purified, it is melted and cast in certificate bars.

These bars, refined to a count of 999.99, are then trundled into a vault which is sealed in the presence of witnesses. That seal remains unbroken, a government assurance that behind the paper money turned out by the printing presses in Washington lies a fortune in precious metal.

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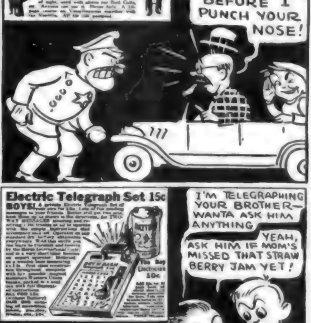

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Is Aerial Warfare Doomed?

(Continued from page 43)

British city in a single day, and that the United States may be bombed or gassed from the air by an enemy air force brought to within striking distance in airplane carriers of the submarine type. Such statements are without foundation of fact.

There is not in the world today a sufficient number of bombing planes to destroy a city the size of London in a month even if we assume that the British would "sit and take it" while the bombs and gas were being showered upon them. As for "conquering" the United States with an air attack brought to us in submarine carriers, consider the facts of the subject.

Air Attack on New York Impossible

Submarines have been built to carry as many as two very small, folding-wing scout planes. Our Navy has one such submarine. By complete alteration of design, building a larger submarine than any ever built, and leaving out all conventional submarine fighting equipment, it would be possible to build a submarine airplane carrier capable of housing two large bombers. Having noted that 14,000 bombers would be needed to gas an area the size of New York, the enemy seeking to attack America's largest city with an underseas air fleet would have to have 7000 submarine carriers. Such a fleet could be built for about $70,000,000,000, and a crew of 700,000 highly-trained men and officers would be needed to operate it. It costs about $500 an hour to operate a single, large, modern submarine. Hence, it would cost about $714,000,000 per day to operate this diving aerial armada. No nation on the face of the earth today could finance such an operation. As an act of war such an attack would have about the military significance of a honeybee attacking an elephant!

Bombing Is Guesswork

By some mysterious appeal to human imagination the aerial bomb has been propagandized as a terrible weapon of destruction. A shell is infinitely more destructive. The aerial bomb is dropped at a target and hitting the target is largely a matter of guesswork. There is mightly little guesswork about hitting a target with a shell over ranges up to 25 miles. A bomb and a shell may carry identical charges of high explosive but still the shell is by far the more deadly. Regardless of the altitude from which it is dropped the bomb will attain a velocity of only about 500 feet per second in falling. The shell, on the other hand, is fired from a piece of artillery and has a velocity of about 3000 feet per second. A shell thus has the power of penetration that the bomb lacks. A shell will drill through heavy armor plate, or through concrete walls. It explodes inside to produce a shattering, internal explosion. A bomb, having no such power of penetration pops off like a paper firecracker against whatever it hits. It can produce only an external explosion that is largely wasted upon the atmosphere.

In an experimental bombing conducted by

Is Aerial Warfare Doomed?

the United States Army, using the condemned Pee-Dee River bridge in North Carolina, for a target, the few 600-pound bombs that made direct hits on the concrete and steel structure dented the bridge but failed to render it impassable. Finally, 1100-pound bombs had to be used to break a single span. Had this trial target been an enemy military position defended by airplanes, modern anti-aircraft guns, and batteries of anti-aircraft machine guns, it is highly improbable that the "attacking" air force could have landed so much as a single bomb upon the bridge.

Jap Aviators Failed

Japan is said to have an air force equal to, or possibly superior to that of the United States. Yet in the recent Japanese military maneuvers in China her air forces accomplished nothing even remotely approaching the predictions so frequently heard from aviation enthusiasts. The aviators did accomplish many important military functions such as scouting, intelligence work, and the like; but even that work was hampered or often completely frustrated by the fighting efficiency of Chinese aviators. Bombing and gassing operations were virtually ineffective. In one instance 6000 pounds of Japanese bombs were rained down at a group of Chinese snipers on top of an old wooden observation tower 150-ft. high. After the Japanese aviators had dropped all their bombs the old tower wasn't even shattered, and the Chinese snipers were still in action.

Since the development of aviation has pointed out the possibility of civil populations being attacked with bombs and poison gas, popular fancy seems to have eloped with the baseless theory that wars will be so waged in the future. It would be the most useless, extravagant, and illogical method of attempting to win a war. The objective of any war is the subjugation of military forces, hence any attack upon civil populations would be like going after a swarm of bees scattered all over a state, instead of attacking the hive. The aerial bomb that might be dropped upon a cathedral could be used to far better advantage against an enemy supply train. The pound of gas that might be used to strangle non-combatants sitting by the fireside would be far more effective in an enemy military camp.

Doughboy Will Win War

The next war, if it comes, will probably be fought very much like previous wars of history. It will be won by the nation that can make the most intelligent and effective use of every available weapon. It will be won by the side that can close the seas to the enemy, and finish the last decisive battle on land with its soldiers on enemy soil. Weapons, whether they be tanks, battleships, airplanes, bombs, poison gas, artillery, or other devices, are only stepping stones toward the goals of winning a war. Every act of war is merely paving the way for the doughboy with a rifle and a bayonet in his hands. It is the doughboy who in the final analysis brings a beaten military power to the peace conference.

"REMEMBER LAST WINTER!"

He counted 19 stalled cars in 9 miles of driving

Mr. J. Edward Lynch, 1195 Union St., Brooklyn, N. Y., drives 9 miles to his office each morning. And on Nov. 15th last Winter he counted 19 cars stalled along the road with "freeze-up" troubles.

But Mr. Lynch's garage service-man had shown him how inexpensively his car could be protected *all Winter long* with only one shot of concentrated anti-freeze. (Yours can show you the same protection-chart, too.) The only anti-freeze that is guaranteed to do this is Eveready Prestone. It will not boil off.

Make the Nose Test: Eveready Prestone, truly non-evaporating, is odorless. But "boil-away" anti-freezes can always be identified by the odor. Regardless of special "treatments," they will evaporate when the engine runs at high speeds.

Mr. Lynch rode all last Winter safely protected by Eveready Prestone. He's using it this year, too... And saving himself a lot of worry and expense.

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Building and Lighting Stage Scenery

(Continued from page 105)

paste. When all flats are completed and covered, coat with cold water sizing to which a little Spanish whiting has been added. This will draw the muslin tight on the frame. When dry, paint with any good cold water paint according to the design of your scenic designer.

Very nice effects may be had by painting first with a neutral gray, buff, or green, over which several coats of a deeper shade are stippled with a nearly dry sponge. Touch the scenery lightly and at random with the sponge. A crumpled up newspaper or rag may be used in the same way. Sometimes character may be added by flicking a wet brush of a contrasting color at the scenery.

Actual Doors and Windows Used

Make the opening in the flat ¾" larger, on all sides, than the door frame. A pair of 6" strap hinges is attached at an angle as shown in Figs. 9 and 10. The hinges are opened after the frame is fitted to the flat, and allowed to wedge against the upright of the flat. The door is securely in place yet it can be removed quickly for scene changes.

Lighting equipment more than any single other item determines the effectiveness of any stage set. Footlights are made up in sections of eight 50-watt bulbs wired in parallel. The upright side of a wooden trough is covered with shiny tin as in Fig. 15.

The Baby Spot Light, Fig. 11, is made from a gallon varnish can from which the bottom has been cut, just inside the flange. The lens from a cheap reading glass is bolted between two ½" blocks, cut to fit to the bottom of the can, and in which openings are cut and beveled. Wing nuts hold the color screen in place. This color screen is folded as shown from flat tin in which openings are cut to fit the size of the lens. A sheet of colored gelatin is placed between these leaves.

Provide Ventilation for Floodlights

The lens blocks are attached to the lamp by a small hinge, riveted to the can and screwed to the blocks and held closed at the bottom by a small coil spring. Holes in the top and bottom are for the passage of air. Baffles are riveted in place as shown to prevent light from shining out. Wing nuts make the 1" strap metal bracket adjustable to any angle. The 250-watt lamp fits into a porcelain base with connecting wires passing out through the spout of the can.

The flood light, Fig. 16, is an empty ten-gallon lard can inverted on a wooden base. The sides are bent to form guides for a color screen. Holes for air are cut in the base and in the top, those above being fitted with a light baffle.

The color frames, of ¼"x2" material, are made to fit the guides on the lamp. Steel wire laced through tiny holes in the frame keeps the colored gelatine sheets from buckling under the heat. A large sheet is placed between two frames and held together with a small wood screw, then slipped into place between the guides on the lamp when colored light is desired. Make several color screens for each lamp.

Thank You for Mentioning Modern Mechanix and Inventions for November When Writing to Advertisers

Steel Birds Build Skyscrapers

(Continued from page 47)

"Yet, it's all in the day's work for them. Look at those steady nerves. Not a wasted motion—no hesitation, although they both know that the slightest gust of wind or an error in judgment might send them hurtling to their doom.

"Notice how everything works methodically. Now the bolt is inserted which will hold the beam in place temporarily. On the heels of the bolter comes the riveter with his helper. The latter is known as a bucker-up. That's his dolly-bar he's putting into position.

The Art of Handling Hot Rivets

"Did you see that flash? That was a red-hot rivet. It came from two stories below and landed in that cone-shaped can which that fellow had poised to catch it. Tossing those rivets is quite an art. Also catching them. I know hundreds of folks stand around down below watching for the moment when the catcher will miss. They seldom do. But it does happen sometimes and then it's unfortunate, especially if the rivet sails through space and into the street below.

"The rivet, as you can see, is held in place by the dolly-bar and the rivet gun drives it in, smashing it in like a machine gun.

"There were 35 riveting gangs at work on the Empire State building. A gang consists of the heater of rivets who passes them to the man who snatches them out of the air with his can and puts them through the hole for the riveter with his forceps, then comes the bucker-up with his dolly-bar and lastly the gunner with his rivet machine.

"Nine erection derricks were required for the Empire State job. A pusher is in charge of each derrick, with from seven to ten men under him known as the raising gang. Not only do they get the girders clamped to the derricks but they are also the setters and the bolters.

"The bolters are the older fellows in the business. They can squat on steel beams already in position to do their work as other units glide through space into position.

Acrobats in Mid Air

"The setters, who must do constant acrobatics around columns of unrelated steel, work practically in space. Their jobs are the most dangerous, but like their fellow workers, all their nerves have been extracted. One seldom hears of a mishap among them, although when they do have accidents, they are apt to be fatal ones.

"The Empire State building was, of course, one of the biggest steel jobs of all time. About 50,000 tons of steel went into it. During one month 22 stories of steel were placed in just that many days. In fact, the entire steel construction took only six months.

"The pick of the steel trade—about 300 of them—worked on the Empire State job. The men came from all over the country, anxious to be part of the picked crew. After the job

(Continued on page 144)

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Surveyors of Alaskan Ice Wastes

(Continued from page 77)

the curvature of the earth is overcome by the natural elevations, thereby making it possible to see for great distances.

From his lofty perch thousands of feet above the ground, the mountain surveyor's line of sight passes through miles of atmosphere of varying density and temperature. Signals are sent from tower to tower by means of powerful beams of light. At great distances during the daytime heliotropes or sun-reflecting mirrors can be used for this purpose. At night the work continues to go forward, through the use of electric lamps.

Night Surveying in the Arctic

Most of the observing and signalling, however, has been done at night. By the use of a special bulb, with a small, compact filament, nearly all the light is concentrated in the desired direction. An automatic clock control has been devised to turn on the light in the early evening and turn it off late at night. Fewer lighthouse keepers are needed and the cost of surveying is considerably decreased.

One of the most important projects of the Coast and Geodetic division under the new system has already been started—the survey of the southeastern costal region of Alaska. Particularly difficult was the work, recently completed—in the high mountainous regions along the Taku and Stikine rivers. These are glacial streams heading in British Columbia and draining areas of considerable extent. The water is heavily laden with silt which hides innumerable banks and snags. Below the Canadian-American boundary line the region is backed by flats heavily timbered with spruce and cottonwood except in a few places where the mountains begin at the water's edge.

Back of the mountain ranges lie great ice caps and many of the valleys are filled with ice, the result of centuries of glacial action. In fact, the nature of the region is such that once a surveyor climbs a mountain he has to stay there until his work is done.

Personnel of the Observing Parties

Observing parties usually consist of an officer and three men. All instruments and camp equipment must be packed in a single trip, hence it is essential that every item packed provide the greatest possible value for its weight. Enough equipment is packed, on most trips, for remaining 10 days at a stretch, each man packing a total of about 80 pounds.

In practically every instance a trail must be cut through the thick underbrush before the mountain itself can be climbed. Often this work requires a full week, whereas the actual climbing might take only a day. The highest mountain climbed for use as a land lighthouse on the Taku River survey was Azimuth, 5,540 feet in elevation, while the highest on the Stikine River was Iskut, 4,710 feet high.

On large-scale projects in Alaska, the surveying personnel, consisting of perhaps a dozen men, will split into two parties, one to build the temporary lighthouse station, and the other to make scientific observations.

Perfected Television Ready for Public

(Continued from page 37)

George Everson, secretary of the corporation, believes television will find more sponsors than the present type of radio program. In fact, he revealed, one of the country's largest department stores has already asked for the "privilege" of backing the first commercial broadcast by Television Laboratories.

"Advertising men are tremendously interested," Everson said. "Television opens a great new field; there will be a grand scramble when it gets started. There was a similar hectic situation when Warner Brothers astonished the movie world with the first talkie."

Radio is now turning to the ultra short waves, according to Farnsworth and Everson.

Television Programs Relayed

Present radio channels, of course, are overcrowded. Eventually the whole industry will operate on short waves that are easily handled and less trouble in tuning. Television requires a broad wave band, but its present active radius does not compare with that of ordinary radio.

A television program from San Francisco, for instance, would go out on a focused beam for a distance of from thirty to fifty miles. Relay stations, scattered at certain points like airplane beacons, would pick up the beam and re-broadcast it.

"Even the motion picture industry will benefit from television," Everson explains, "because there will be a need for numerous short films for broadcast to homes. Manufacturers will find television a faithful servant in presenting images of their products. An auto maker could, for example, show millions of motorists how his car is constructed.

Transmitters Are Portable

"Portable television transmitters, weighing not more than ninety pounds, can be built for airplanes or submarines, with telescopic lens for news photos, maps, war-time scouting. And naturally, radio programs become more effective if performers are visible."

In 1926 men in four laboratories, Dr. Ives of American Telephone & Telegraph, Dr. Alexanderson of General Electric, Baird of England, and Jenkins of Baltimore, were struggling with the problems of television. At that time Farnsworth said to Everson:

"They are trying to achieve television by mechanical scanning discs. I believe the speeds involved are too great for this method, and that nothing of a mechanical nature can accomplish the purpose."

Farnsworth was then pioneering with photo-electric cells and cathode ray tubes. Today many other experimenters have followed his footsteps.

The Farnsworth set operates somewhat in this manner:

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(Continued on page 141)

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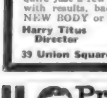

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Coastguard—Heroes of the Sea

(Continued from page 83)

chored in the bay so that the coastguard will be ready with this means of rescue.

For when it does, the need is desperate. It means that the distressed ship cannot be reached by boat and that the only hope of rescue lies in the coastguard being able to shoot a line, usually in the teeth of a howling blizzard, across the spars of a ship a hundred or more yards from shore where other and heavier lines are drawn out until the heavy rope cable is able to sustain a man.

Playing a prominent part with the breeches buoy during rescue work for years has been the man powered surf lifeboats. With the development of gasoline engines, two other types of boats have been added to land stations—powered lifeboats and power surf boats. The latter are not as heavy as the lifeboats and can go into shallow waters.

Design Uncapsizable Boat

Now science has gone a step farther. Down at Curtis Bay in Baltimore, a new fifty-two foot powered lifeboat is in process of construction. As a large portion of the design work has not been completed, coastguard authorities refuse to give out any specific information, but it has been learned upon reliable authority that these new and powerful boats are planned to be the last word in naval construction. They will include the best and most time-proven principles of life saving as now used on American, Norwegian and English life craft. When completed, powered by two engines, self bailing and practically unsinkable, this uncapsizable boat will be able to go anywhere in any weather.

It is also understood from official sources that these new boats in many ways resemble the new thirty-foot powered lifeboats which are replacing, as rapidly as possible, the older equipment. Built at a cost of $13,000 apiece, they, too, are self-bailing, non-capsizable and able to live in almost any sea. The streamlined bow has been carefully rounded so as to allow heavy seas to break and flow over the forward cabin and yet in no way impede or endanger progress.

Bails Dry in Eleven Seconds

There is a squat engine house amidships and a bridge aft where the helmsman, lashed to the wheel, if necessary, is protected from both sea and weather by a sloping superstructure. The boat is lined with huge sponsons or blocks of live cork to give it additional buoyancy. It is equipped with a two ton bronze keel so that it will right itself in heavy seas. These ships can right themselves and bail themselves dry in less than eleven seconds.

The small but compact cabin contains a short wave receiving set. Fourteen out of the fifty-two coastguard bases and life saving stations are equipped with radio broadcast transmitters so that constant radio communication can be maintained with these new powered lifeboats. This winter all fifty-two stations will be equipped.

Stowed away in the new lifeboat is a spare sail and spars for use if the engine should

become disabled. Regulation life saving equipment includes a shoulder gun for shooting the life line with an accurate range of 150 feet. There are fire extinguishers, coston signals and lanterns.

In the engine room is a 100 h.p. Sterling motor. The engine is so constructed that even if the boat capsizes it will not affect the motor. In fact, during one exciting rescue on the Columbia river on the west coast, the lifeboat ploughing her way through heavy seas pitchpoled, in other words turned a somersault. All of the crew were pitched into the water with the exception of the engineer safe in the watertight engineroom.

Upsets, But Engineers Stay Aboard

Just as soon as the boat righted itself, the engineer came on deck, turned the boat around, and rescued the crew.

All of these new thirty-six foot power boats are controlled from the afterbridge. Beneath sprayhood and behind the broad glass windshield a helmsman controls the movements of the ship. Beside the wheel there is compass, searchlight and loud speaker connected with the radio in the forward cabin. An illuminated instrument board keeps the helmsman informed of the operation of the motor. In the stern compartment there is an emergency tiller for use when the steering wheel is damaged. There is also a large oil tank with adjustable nozzle extending out over the hull to pump oil overboard to calm breaking seas.

Both rudder and propeller have been incased inside the keel to protect them against ice and rocks.

Airplanes Assist in Rescues

Airplanes in recent years are playing an increasing part in coastguard work both in making rescues as well as in locating lost ships or shipwrecked mariners and then communicating by radio with division headquarters. By their ability to cover vast distances within a short time, they have rendered invaluable service and also have made thrilling rescues.

In 1933 there were 6,492 lives saved throughout the United States by the coastguard, 33,716 persons on board ships received assistance and 595 persons in distress were cared for. There were 7,176 instances where lives were saved and vessels assisted and 7,476 instances of miscellaneous assistance. During the year, 300 derelicts and other obstructions to navigation were removed and destroyed and other derelict ships salvaged to the value of 855,565. Over 83,000 vessels were boarded and papers examined and 1,549 ships were seized or reported for violations of law.

With discoveries constantly being made and the use of radio increasing daily it is logical to believe that more lives will be saved and still more ships salvaged.

Still, judging from the past, it is probable no matter what sort of inventions are perfected these coastguard men will continue to be fighting heroes of the seas.

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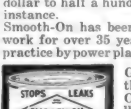

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Revising Map to Save Nation

(Continued from page 60)

To accomplish this the government is creating new frontiers. Each of the government's reclamation projects will provide new land for these people. The most outstanding experiment is being conducted in the territory, sometimes called the forty-ninth state, under control of the Tennessee Valley Authority. This territory, comprising 40,000 square miles, an area as large as England and crossing seven states—Tennessee, Virginia, North Carolina, Georgia, Alabama, Mississippi and Kentucky—is the scene of engineering feats and a practical test of economic and social theories never witnessed outside of Soviet Russia.

To Build Model Cities

In this valley, 700 miles long and 50 miles wide containing 6,000,000 persons, the TVA will conduct the government's initial drought experiments, for much of the land is in danger of becoming a desert. Under the TVA's domain are the Wheeler dam and the Muscle Shoals dam in Alabama.

In less than two years the TVA is expected to complete the Norris dam, most important of the three dams, on the Clinch river, 80 miles above its entrance into the Tennessee. The main dam will be 20 stories high and will create a lake with a shore line of 900 miles. The size of the project can be realized when it is pointed out that the shore line of Lake Michigan is 1,000 miles long. With the aid of these dams the TVA will seek to improve agriculture, retard soil erosion, control floods, open the Tennessee river to navigation, and produce electric power.

Here, too, model cities are being built where the TVA will instruct inhabitants in the arts of weaving, furniture making, china firing and other industries. Men will be put to work on government projects, working only five and a half hours a day, their leisure time being used to learn these industries.

Forest Belt Big Experiment

Most sensational of the government's drought projects is the planting of a forest 100 miles wide and 1,000 miles long across the states of North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas.

At a cost of $75,000,000 the government expects to increase rainfall in the drought stricken area and to cut down wind velocity that is responsible for carrying away rich soil in the form of dust storms. Three and one-half billion trees will be planted in strips 100 feet wide and a mile apart on the total area of 100,000 square miles. Experimental forest strips have shown that wind velocity can be reduced 25 per cent, evaporation 30 per cent, and rainfall increased three inches.

Other outstanding projects which will open streams to navigation, generate power, or put new lands into cultivation to replace abandoned areas include: the Mississippi river waterway at a cost of $100,000,000; the Columbia river reclamation and power dams, $100,000,000; Boulder Dam, $48,800,000; Fort

(Continued on page 143)

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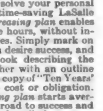

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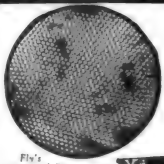

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SEE PAGE 26

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Microscope Probes Kitchen Secrets

(Continued from page 65)

these two classes of objects? A simple demonstration will furnish the answer.

Add a bit of salt to water in a dish or bottle and stir or shake until dissolved. Place a drop of this solution on a slide and allow to dry.

Apply balsam and a cover. Examine and note the salt crystals, which have reappeared with the evaporation of the water. Each kind of chemical substance of the salt type has its characteristic size and shape of crystal, with a given geometrical pattern of construction, readily identified by those who have made a study of crystallography. The process of crystallization may be watched under the lens and the manner of formation of these crystals observed. Mount a drop of solution, add a cover glass, and see what happens as the water slowly evaporates.

Studying Action of Salt Molecules

When sodium chloride is dissolved in water, it is believed that the salt structure is not only broken down so that the smallest physical particles of the salt—the molecules—mingle with those of the water, but also that these salt molecules are dissociated or separated into their component ions of sodium and of chlorine. So free a dispersal as this constitutes what is termed a true, or chemical solution. On the other hand, sugar, a complex organic substance, cannot be broken up to this extent and the smallest particles realized on dissolving in water are the relatively large sugar molecules. Such a condition is called a physical or mechanical solution, and grades into a mere suspension in cases where the "dissolved" particles are larger than molecules, as is true with carbon, carmine or starch.

The most important accessory you could add to your equipment, after purchasing a microscope, slides and covers, is a microscope lamp. There are many types on the market, but should you prefer to make your own, the most readily available object to operate on is a coffee can. The only tools needed are a punch, hammer and tin snips.

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Discard the lid and turn the can bottom up. Place an electric light socket on top of the center of this can bottom and trace around it with a sharp nail or soft pencil. Punch a few holes so as to work in one blade of the snips, then cut out this circle. The socket should now pass through the opening until the swollen part is reached or until the screw threads with which many sockets are provided engage the cut rim, preventing the fixture from falling through.

Proceeding in this manner, cut out a half-circle at the bottom of the inverted can about 2½ to 3" high. Use a compass or trace around some circular object of convenient size, as a guide. Around the upper rim of the side of the can, punch a number of holes for ventilation. Insert a 25-watt bulb in the socket—blue daylight glass preferred, opal glass second choice—and your coffee-can lamp is ready for use.

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Know Fine Points of Duck Shooting

(Continued from page 53)

watching just one duck but can keep track of the others. After bringing down his duck, he knows where the rest of the flock is and can be ready for the next shot.

The hunter shooting from the right shoulder is inclined to be weak on his shots to the right. The opposite is true of the man shooting from the left shoulder. To overcome this weakness practice shots on your weak side. Trap shooting is a great aid. Skeet shooting is too fast, but, if the traps are set high so as to send the birds flying 30 or 40 yards high towards the sportsman, he can become a good duck shot. If possible, the traps should be placed to release three birds at once towards the hunter.

Correcting "Crossed" Hunters

Quite often a duck hunter is "crossed" in his shooting and does not know it. He practices diligently, but finds himself shooting behind the duck. Disgusted he blames the shells or the gun and may go so far as to buy a new gun. Actually the fault may be with himself. He probably is shooting from his right side when his left eye is stronger than the right. Under this condition he will have difficulty becoming a good shot.

There is a simple test to determine which eye is stronger. Take a ring about one inch in diameter and hold it at arm's length. With both eyes open center it on some object in the room. Close one eye and then the other. The eye that holds the object in the ring is the stronger. If you are right handed but your left eye is stronger, you should try to shoot from the left side. If you find it impossible, learn to shoot with both eyes open. This will give you more correct vision and help you to overcome the difficulty.

Wind's Effect on Shots

Judging the effect of wind on shots is one of the most difficult factors to learn. The wind, of course, will carry the shot off its course in the direction towards which the wind is blowing. If the wind is blowing from the right and the duck is flying towards the hunter, the marksman must not only lead, say five feet, but shift his gun to the right or towards the wind approximately eighteen inches. If the bird is flying with the wind the lead must be reduced eighteen inches. If flying against the wind, increase the lead. The best way to learn the effect of wind is to practice target shooting in all kinds of weather. This is important because duck hunting is usually best in rough weather.

Wind should also determine your position on the lake you are hunting. Ducks always work a lake against the wind. If you are hunting in a rice bed, you will have first chance at the ducks as they come in if you are on the windward side. If the wind changes, shift again to the windward side. The ducks are most likely to come into the lake over a stream entering the lake or through a break in the forest on the shore. If you are on a stream, the flock will come down the river or over low, swampy land on the windward side. The flock usually

(Continued on page 138)

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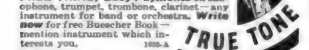

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Know Fine Points of Duck Shooting

(Continued from page 136)

flies with the wind, circles the lake and comes down against the wind.

By watching the flight and actions of ducks you can learn to identify the different species as well as know just what they will do and in that way score more hits. Bluebills, canvasbacks, redheads, and teals, in the speed or diver class, fly in a cluster and never fly true to course. The flock will shift up and down and off to the side as it flies through the air. Mallards, pintails, gadwalls, widgeons, and spoonbills, in the dipper class, fly in formation, in V's or in strings. The flock seldom shifts from its course, but usually flies straight. Some of these ducks will depend on their speed to get them out of danger when they near the water; others will come in cautiously and when they are in danger flare into a twisting, dodging, weaving flight to get them out.

How to Pattern Gun

You should learn to pattern your gun to make sure that you are using the right kind of shot. Usually a gun will handle shells best if they are loaded with even number shot. On the other hand the pattern may show that odd number shot should be used.

To pattern your gun, put a full size drawing of a duck on a sheet of paper 30 inches square. Place the target at a distance of 40 yards. Aim and fire at the duck and then study the pattern. With No. 4 shot the duck should be hit in five vulnerable places—one shot in the head or neck, one breaking a wing bone in either wing, and three shots in vital parts of the body. No. 5 shot should show seven vulnerable hits and No. 6 nine hits.

Next study the pattern for evenness. If it is patchy, that is shows four, five or more shots clustered together and others scattered unevenly among other clusters, you are using the wrong shot. If you are using an even number shot and getting a poor pattern, your gun probably should handle shells loaded with odd numbered shot. In studying patterns with different shot always be sure that each shell is loaded with the same amount of powder.

What Shot to Use

If your gun patterns a No. 4 shot best, it should use only even numbered shot. If the No. 5 pattern is best, use odd shot. This is a good thing to remember. If your dealer is out of No. 4 shells, you will know that your gun can handle No. 6. If he is out of No. 5, get No. 7. For all around shooting, No. 6 is best. If your shooting is confined mainly to heavy ducks, such as mallards, use No. 4 shot.

In selecting a gun be sure to get a standard make. The gauge to select is a subject of controversy among duck hunters. Remember, though, that at 40 yards a 12-gauge will cover a pattern 30 inches in diameter, a 16-gauge a pattern of 24 inches, and a 20-gauge an 18-inch pattern. It is not difficult to see that the man using a 16 or 20-gauge must be a better shot than the one using a 12-gauge. For that reason a 12-gauge is recommended for all around shooting.

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29x5.00-20	2.85	1.05		29x4.75	3.35	1.15
28x5.25-18	2.90	1.15		29x4.75	3.45	1.15
29x5.25-19	2.90	1.15		31x4.75	3.45	1.15
30x5.25-20	2.95	1.15		28x5.25	3.65	1.30
31x5.25-21	3.25	1.15		29x5.25	3.75	1.45
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Thank You for Mentioning Modern Mechanix and Inventions for November When Writing to Advertisers

Camera to Bring Television to Home

(Continued from page 129)

to the lights and shadows of the picture. These charges, which are really flows of electrons, are focused by a solenoid which surrounds the tube. Alternating current scanning coils cause the electrical image to oscillate across a pin-point opening in the anode. The electron images coming through the hole are picked up and amplified in Farnsworth's new "cold cathode" tube.

Multiplication of current is so intense that pictures or subjects can be picked up in almost any light, eliminating the necessity of Kleig or other artificial light for studio broadcasts. The transmitter has powers similar to that of the candid camera.

The outgoing picture waves are brought into the television receiver through an "electron gun," a cathode ray tube. The set also picks up a synchronizing "pulse" to keep the receiver in step with the transmitter. The process, from the layman's view, is really a reversal of the broadcast.

Scanning currents in the receiver sweep the cathode tube ray back and forth, the constant sweep building the visible picture on a fluorescent screen. The television picture is truly a quilt of quivering rays which, controlled, merge into a steady pattern.

Farnsworth has developed tubes that give an original picture nine inches square; a magnifying lens, such as he has placed on one receiver, makes it even larger.

Television Laboratories waited patiently for a year before announcing perfection of the apparatus. In the interim Farnsworth was busy with the "cold cathode" tube, a tube without filament or grid, to serve as the final link.

"We did not wish to make public any development that was not practical or foolproof," Everson said.

Preparing Camps for Cold Weather

(Continued from page 55)

erably notching them into the back logs. The object of the ends to the reflector is to prevent the wind from either side blowing away the heat.

By heating a stone thoroughly, but not too hot, and by wrapping it in a blanket and placing it under the blankets at the foot of the bed, the heat will be retained throughout the night. In a tent in the autumn a number of stones heated and placed around in the tent will take the chill off and keep the tent warm during the night. To accomplish this, locate all the stones you need for camp use at night, place these close together and make your fire on top of them. When ready to retire roll out the stones and bring them inside.

If camping on a large flat rock, build a fire on the rock and when ready to retire, sweep the fire and ashes away, erect the tent over the heated area of the rock, and you will keep warm all night.

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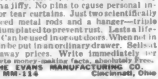

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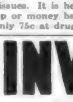
INVENTORS
SEE PAGE 26



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Balloon Seeks Cosmic Ray Secrets

(Continued from page 45)

The short-wave oscillator uses a wavelength of about twenty meters and is kept in continuous operation by means of current from a battery of dry cells. The barograph has a quartz diaphragm which, in accordance with changes in atmospheric pressure, varies the capacity of a condenser and changes the frequency of the transmitted radio wave. The atmospheric pressure readings enable men to determine the balloon's height.

Temperatures are recorded by means of a balance wheel whose vibrations are affected by temperature changes. These varying vibrations interrupt the carrier radio wave and leave a record on the radio tape from which temperature may be calculated.

The cosmic ray meter is so constructed that all other rays are excluded. As the cosmic rays penetrate the meter, they affect a delicate electrometer by ionization, creating an electric current inside the chamber. The movements of the electrometer so affected in turn actuate a small mirror which reflects a beam of light shining on a photo-electric cell. Interruption of the light beam sets up, by means of an oscillator, a signal in the short-wave radio transmitter. This signal is recorded on the receiving tape.

Thus, through radio, scientists safe on the ground may instantly obtain vital data as to the height of the balloon, the temperature surrounding it and readings as to the intensity and other characteristics of the mysterious cosmic rays.

Fortunes in Needed Inventions

(Continued from page 75)

Who can invent a simple little screen for automobile windows that will fit in place on any car and that will be cheap enough to be sold in the chain stores?

A simple but practical and inexpensive means of providing a baby carriage with runners in place of wheels so that it can be used in snow is needed.

A metal container to hold household matches and that would ignite the matches one by one as they were pulled out would be a big seller at 25 cents or less.

Men would be quick to appreciate and buy a simple but invisible device that would keep soft collars pulled together under ties.

There is still needed a simple little indicating fuse. Although we have a number of patents covering devices of this nature none of them cover a commercially acceptable article. By an indicating fuse is meant one that will indicate that it has blown.

A new method of fastening carpet to stairs that will avoid rods and carpet tacks. What is needed is a new sort of a device less expensive than rods and more effective. Not only should the device be installed more easily but it should also permit the carpet to be removed with little trouble.

A one-wheeled folding baby carriage with provisions for standing. This should be cheap and when folded it should occupy very little space.

Thank You for Mentioning Modern Mechanix and Inventions for November When Writing to Advertisers

Revising Map to Save Nation

(Continued from page 133)

Peck Dam, $175,000,000; Missouri river channel, $18,000,000; Casper-Alcova project, $22,700,000; the All-American canal, $6,000,000; and subsistence homesteads, $25,000,000.

Of these the most ambitious is the Grand Coulee project in the states of Washington and Oregon. In territory now arid the government expects to develop an industrial and agricultural empire by harnessing the energy of the mighty Columbia river. Here eleven dams will be erected to generate 20 billion kilowatt hours of power and reclaim more than a million acres. The central point of this greatest project of the government will be Grand Coulee dam in Washington.

Fort Peck Largest Earth Dam

The Fort Peck dam in Montana will be the largest earth fill dam in the world. It will be four miles long, the largest fill being 8,500 feet across and 231 feet high, requiring 90,000,000 cubic feet of earth. Since the prairie land offers no solid base for a concrete dam, the project will be built of earth faced with concrete. The dam will be a half mile wide at the bottom and 100 feet wide at the top. It will create a lake with a shore line of about 2,000 miles on the Milk river above its entrance into the Missouri.

It will hold back flood waters in an area of 57,725 square miles and reclaim 232,000 acres of swampy, untillable land which eventually will be worth $11,600,000, benefiting a population of 2,000,000. It will stop erosion of lands on the lower Missouri, in South Dakota, Nebraska, Iowa, and Missouri, which have suffered damages of $75,000,000 in the last ten years, and provide an even flow of water for navigation on the Missouri.

The Missouri river area will be further improved by providing it with a 6-foot channel between Kansas City and Sioux City for cheap transportation of farm produce and the protection of land from floods.

The "Father of Waters," the Mississippi river, will be provided with a series of dams and dredged to maintain a channel of 9-foot depth navigable the year around. In addition to transportation the dams will develop power and hold back flood waters which have ravaged the lower Mississippi area.

Boulder Dam Is World's Highest

The Casper-Alcova dam in Wyoming is next in scope to Grand Coulee dam. It will put into production 66,000 acres in the North Platte river district. Once filled, the dam can irrigate the territory for five years without renewal of its water supply.

When completed Boulder Dam will be the highest dam in the world. Its 730-foot wall will hold back a reservoir 115 miles long. This huge lake will have a potential output of 1,800,000 horse power. Its water will supply the household and industrial needs of 10,000,000 people in the surrounding states of Nevada, Arizona and California. It will also protect 70,000 inhabitants of the Imperial Valley against floods.

(Continued on page 144)

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National Automotive School trains you in both trades—auto and high speed Diesels. Practical shop methods. Expert instructors. A million dollar school to train you by proven methods. Established 29 years.

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29x4.50-20	2.35	0.85	31x3.25-21	3.25	1.15
30x4.50-21	2.40	0.85	29x4.5-20	3.35	1.15
28x4.75-19	2.45	0.95	29x4.50-19	3.35	1.15
29x4.75-20	2.50	0.95	30x6.00-18	3.60	1.15
29x5.00-19	2.85	1.05	31x6.00-19	3.65	1.15
30x5.00-20	2.85	1.05	32x6.00-20	3.45	1.25
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Size	Tires	Tubes	Size	Tires	Tubes
30x3	$2.25	$0.65	32x4½	$3.35	$1.15
30x3½	2.35	0.75	33x4	3.45	1.15
31x4	2.95	0.85	34x4½	3.45	1.15
32x4	2.95	0.85	30x5	3.65	1.35
33x4	2.95	0.85	33x5	3.75	1.45

HEAVY DUTY TRUCK TIRES

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Size	Tires	Tubes	Size	Tires	Tubes
6.00-20	$3.75	$1.65	30x5	$4.25	$2.65
6.50-20	4.45	1.95	32x6 8-ply	7.95	2.75
7.00-20	5.05	2.25	32x6 10-ply	8.95	2.75
7.50-20	6.95	3.75	36x6	9.95	3.95
8.25-20	8.95	4.95	34x7	11.95	4.25
9.00-20	10.95	5.65	36x8	12.45	4.25
9.75-20	13.95	6.45	40x8	15.95	4.95

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Let Lincoln train you for sure success. Government Approved School. 14 years teaching aviation. 21 years successful mechanics trade school. Write. State age.

LINCOLN AIRPLANE & FLYING SCHOOL
401D Aircraft Bldg. Lincoln, Nebraska

Steel Birds Build Skyscrapers

(Continued from page 127)

was finished many of them disappeared, looking for new adventures.

"The steel bird, you see, is a good deal of a rover. He may be on a job in some big American city and suddenly hop off for another in London.

"Their pay is very good, I'd say, topping that of most of college professors. On the Empire State job the men worked 10 hours a day with 12 hours' pay, making about $140 a week.

Breaking Into the Steel Gangs

"Most of the men break into their jobs by serving as helpers. The usual apprenticeship lasts two months. In that period a man has a good chance to size himself up, to see how he takes to the ozone up in the clouds. We always have a structure going up where the beginner can get plenty of practice prancing around in the heights. If he can't take it standing up, gets wobbly and shaky, then he knows himself it's no use going on.

"No steel bird ever bluffs us as to his qualifications. The quickest test is to let him hop on a weight-ball and get the winches going, hoisting him up to the 30th or 40th floor where there's only a thin steel web on which to perch. If he hollers 'Ouch!', he can't join our exclusive fraternity.

"As a foreman I pick my own men myself, and I pick 'em to work together. Running up a building is like playing baseball. You've got to have a team. There isn't any more place in the steel gang for the individual star than there is on a baseball team.

"If your men didn't work together, everything would be slowed up. You'd have to keep yelling at your derrick man. He'd always get the signals wrong. You'd have trouble all over the place. That's the kind of trouble that would shorten life and it's just what we avoid in our advanced system of steel construction. Tough guys—that's what it takes to make good steel men!"

Revising Map to Save Nation

(Continued from page 143)

The largest irrigation canal ever contemplated, the All American canal through the Imperial and Yuma valleys in California, will be 80 miles long and irrigate 850,000 acres by diverting the waters of the Colorado river through the Imperial dam near Yuma, Ariz. At an additional cost of $10,000,000 it will be extended 135 miles into the Coachella valley to water another 120,000 acres.

On waste land abandoned by farmers and in areas close to large cities the government will build subsistence homesteads. The plan is to put 3,000,000 unemployed and office and industrial workers on small farms of two or three acres. The intention is not to increase agricultural production or to operate the homesteads at profit, but to give workers land on which garden crops can be raised for the use of their own families. The homes will sell for $2,000 each and will provide excellent living quarters and garden food for workers employed or seeking employment in nearby cities.

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ILLIAM POWELL'S
:CRET STRUGGLE

ım Powell is looked upon today as a top-notch But success has not always been his. He tasted :tter tea of rebuke and failure. You will want d his interesting story, **William Powell's Secret gle**, in November SCREEN PLAY.

Y MORE—There are many other intriguing, exciting in November SCREEN PLAY, including such per- ies as Jimmy Cagney, Myrna Loy, Louise Fazenda, ı Shearer, Ethel Merman, Ann Sothern and Bing Crosby. is a fine story, **A Hollywood Closeup**, by Achmed lah. All the latest pictures are reviewed in a candid r. The finest selection of portraits and intimate pic- o be found in any movie magazine.

he winners of SCREEN PLAY'S reat $1,000 Caricature Contest are announced in the

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INVENTIONS Open New Business Markets

This tailgate elevator is driven by a worm gear which derives its power from a take-off on the truck's driveshaft. Movement is under operator's complete control at all times.

Crash helmets for auto, motorcycle or speed boat race drivers now combine safety and comfort. The helmets are made of pulpwood, linen, sponge rubber, leather and cloth.

A cigarette holder quickly attached to the dash of your car holds a dozen cigarettes, feeds, automatically lights and serves a smoke at the touch of a lever.

Pocket knife whittling is given a new impetus with publication, by an Eastern manufacturer, of a booklet illustrating various things to do with a pocket knife.

An all-wave antenna has an automatic frequency selector whereby a broadcast antenna or short-wave antenna circuit is provided for intercepted signals with a minimum of background noise.

Coffee may be made at the table with this individual dripolator.

A new butter churn is made to fit all types of gyrator washing machines. The machine is featured by a special divided dash.

Tree surgery receives a boost with a new plastic rubber cavity filler which will not crack like concrete.

Storage battery separators made of a new kind of vulcanized rubber are said not to be affected by heat or vibration. They are expected to function as an insulator, last indefinitely and do not obstruct electrolyte flow.

A new pressure cooker is said to cook an entire meal of meat and three vegetables in eight minutes. Mineral salts, vitamins and natural flavors are said to be sealed in and burning or scorching is impossible.

A jewelers' instrument records each beat of a watch electrically, enabling operator to determine by means of lighted numerals on machine's dial the number of seconds lost or gained by watch in 24 hours' time.

A home movie projector now throws images five and six feet wide upon the screen, using only the small 8 mm. film. The picture is more than 200 times as wide as the film employed.

A cotton gauze bandage is impregnated with a substance which makes it stick only to itself and holds without fastening. The bandage will not adhere to skin or wound and is not affected by the action of either alcohol or water.

Sharpening household scissors is a simple task with a new carborundum stone which maintains correct bevel yet sharpens almost instantly.

Anticipating future demands, this air-conditioned bed consists of a canopy and cabinet (see photo at right) which makes the hottest night bearable. The device is operated by a one-fourth horsepower electric motor at small cost.

Editor's Note—Addresses of manufacturers of these and other new products in this issue can be obtained by sending stamped, addressed envelope to MODERN MECHANIX AND INVENTIONS. *Manufacturers are invited to submit photos and literature for this page.*